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ABSTRACT

The first part of this document is a report of a project conducted in Texas to develop and deliver a viable education and training system that would produce a competitive work force. The system is built on the SCANS (Secretary's Commission on Achieving Necessary Skills) competencies and personal qualities that are generic to all occupations. Four products were developed for the occupation of electronic engineering technician: (1) a SCANS Occupational Analysis Handbook; (2) curriculum enhancements that can be infused into the electronic engineering technicians curriculum using the format of a basic course outline; (3) assessment and certification strategies; and (4) a professional staff development plan. Following the report, the occupational analysis handbook contains the results of analyses that were conducted for the purposes of identifying instructional content in relation to the requirements of the workplace identified by SCANS research, and defining specifications for Work Keys assessments for selected workplace skills identified by SCANS research; the handbook also includes tables that relate the skills profiled to other analyses and skill standards. The curriculum enhancements package contains basic course outlines that identify the SCANS competencies to be taught. The assessment and certification strategies document includes a report on focus groups held with electronics instructors and examples of competency exams used in Texas two-year colleges. The staff development plan provides examples of a job inventory survey for validation of tasks/competencies, professional improvement needs assessment surveys, and an evaluation plan. Appended to the document are quarterly reports and project meeting minutes. (KC)

ED 397 253

FINAL REPORT

TEXAS SKILL STANDARDS AND CERTIFICATION PROJECT
FOR
ELECTRONIC ENGINEERING TECHNICIANS

Sponsored by:

Tri-Agency Partnership

Conducted by:

Texas Instruments

and

University of North Texas
School of Merchandising and Hospitality Management

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PURPOSE

The Texas' Tri-Agency Partnership, composed of the Texas Department of Commerce, the Texas Education Agency, and the Texas Higher Education Coordinating Board jointly sponsored, funded, and conducted a series of work force development and education coordination projects. The projects operated from January, 1994 through December, 1994. Continuation will be funded by the Texas Higher Education Coordinating Board from January, 1995 to June, 1995.

One of the five categories for which the Tri-Agency Partnership offered joint Job Training Partnership Act and Carl D. Perkins Vocational and Applied Technology Education Act funding was known as the Skill Standards and Certification Strategies Projects. These projects were to infuse foundation and workplace skills identified by the Secretary's Commission on Achieving Necessary Skills into existing vocational-technical curricula. The purpose was to enable students to apply those skills along with the state-of-the-art technical skills in occupations critical to the economic development of Texas.

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EXECUTIVE SUMMARY

TEXAS SKILL STANDARDS AND CERTIFICATION PROJECT

Texas Instruments

and the

University of North Texas

December 31, 1994

EXECUTIVE SUMMARY

TEXAS SKILL STANDARDS AND CERTIFICATION PROJECT FOR ELECTRONIC ENGINEERING TECHNICIANS

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FUNDING INFORMATION

Project Title: Texas Skills Standards Project

Funding Source: Tri-Agency Partnership

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Abbott Labs:	John McLaughlin

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Enrique Garcia	Laredo Community College
Arnulfo Garcia	Texas State Technical College - Harlingen
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I. INTRODUCTION

Background

The development and maintenance of a quality workforce is imperative if Texas is to be competitive in a global economy. Staff of the State's Tri-Agency Partnership composed of the Department of Commerce, the Texas Education Agency, and the Texas Higher Education Coordinating Board have done extensive research to identify projects and products that serve as components of a system that will ensure the development and maintenance of a workforce that will be highly competitive in a global economy.

The **Texas Skills Development Program** was initiated for the purpose of developing *"an education and work force training system that has the ability to measure and ensure that workers have the skills needed by business and industry to compete in a global economy."* The **TEXAS SKILLS DEVELOPMENT PROGRAM: Report to the Governor,** August, 1993, recommended that the skills required to enter employment identified by the Secretary's Commission on Achieving Necessary Skills (SCANS) be adopted as core skills *"which employers say are fundamental to success in the workplace."*

The Secretary's Commission on Achieving Necessary Skills (SCANS) conducted research to verify *"workplace know-how"* which defines effective job performance today. In the SCANS document, **WHAT WORK REQUIRES OF SCHOOLS** it is stated:

> ***"This report identifies five competencies and a three-part foundation of skills and personal qualities that lie at the heart of job performance. These eight requirements are essential preparation for all students, both those going directly to work and those planning further education."*** and ***"These competencies differ from a person's technical knowledge."***

Another report of SCANS, **SKILLS AND TASKS FOR JOBS** was issued by the commission to assist educators make high school courses more relevant to the needs of a competitive workforce. The job analysis process used for this report was not definitive since time and resources did not permit the use of a valid sample of occupations or persons within occupations to assure the SCANS competencies and foundations were generic to all occupations. It was stated in the same report that:

> ***"Individuals developing high school curricula will find this report a useful way to relate teaching of high school subject matter to the skills required in the workplace. It will help them teach these skills in existing or new curricula and develop instructional strategies. These skills can be taught in a range of courses from art and music to science and mathematics."***

Based on the review of the documents cited above, it is concluded that concepts of education and training that are being advocated in a subliminal mode are that instructional content and teaching methods must be revised to assure that:

- Instructional content is taught in context - *"learning to know"* is taught in relation to *"learning to do"*;
- Instructional content is derived from the workplace for career preparation;
- Skills developed other than specific job tasks are transferable;
- Included assessments that are criterion referenced and performanced based with pre-established standards of performance.

The *"SCANS Skills"* are workplace skills that have been identified by SCANS as being common or generic to many different occupations. Based on the statement, *"The competencies differ from a person's technical knowledge."*, made in the SCANS report, **WHAT WORK REQUIRES OF SCHOOLS**, it is concluded that the SCANS Skills are not the technical skills or **skill standards** required by the different occupations of the workplace. The emphasis of the publications resulting from the SCANS has been on the restructuring of the K - 12 curricula to assure that students completing high school have attained the generic workplace skills identified by SCANS research.

From the information cited above, it was determined that the SCANS Skills are core and should be prerequisite to the technical courses in any occupational preparation curriculum. Appropriate application and the development of higher levels of proficiency of the SCANS Skills in relation to the appropriate technical skill should be the primary purpose of technical content for the SCANS Skills.

Statement of the Problem

A review of the projects and research results conducted and/or compiled by the Tri-Agency Partnership staff revealed that the resources are available to develop and deliver a viable education and training system that would produce the desired competitive workforce. Resources identified as being available for the development and delivery of comprehensive workforce education and training system included:

- Technical curricula and instructional content;
- SCANS competencies and foundations which are core requirements for successful entry-level employment;
- Occupational/job profiles (ACT Work Keys);
- Procedures for identifying occupational competencies (learner outcomes);
- Procedures for developing occupational competency exams and assessments criteria (standards); and
- Competency-based (outcome-based) instruction systems.

Need

There was a need to combine the available resources which started by developing and demonstrating a method or process, that can be replicated by integrating SCANS Competencies and Foundation Skills into current occupational education/training curricula.

II. PROCEDURES

Texas Instruments' Job Enhancement Program (Bidder) in coordination with the **University of North Texas** (Contractor) with the support of the **Electronics Industries Foundation** (Co-Bidder) and with the cooperation of the leadership from the Texas Educational Articulation Model (TEAM) for training electronic engineering technicians had the opportunity to receive one of four **SKILLS STANDARDS AND CERTIFICATION PROJECTS** in Texas. The **purpose** of the first year of these projects was to:

> ***". . . build a viable method for integrating SCANS skills into the technical training curricula in Texas so that students will be able to apply the SCANS skills along with the state-of-the-art technical skills."***

This project will assist in bringing about a needed system-wide **reform of public educational institutions which have a responsibility** for assisting in developing a quality work force that is competitive in a global economy. Statewide reforms include five key components: **1) Skills Standards (including SCANS) by occupations identified and/or validated by the workplace; 2) curricula developed based on the skills standards; 3) high quality instructional materials, facilities, and equipment; 4) faculty highly qualified by subject mastery and professional development; and 5) student assessments in formative and summative modes and tied to the workplace requirements via the curriculum.**

The Texas Skill Standards and Certification Projects sponsored by the Tri-Agency Partnership were to produce four documents: (1) SCANS Occupational Profile Handbook; (2) an Enhanced Curriculum Package; (3) a Testing and Certification Strategies document, and (4) a Professional Development Plan.

SCANS Occupational Profile Handbook

For this project this document was titled, ***"Occupational Analysis Handbook for Electrical Engineering Technicians"***. The primary purpose of this **Handbook** was to develop a scale (profile) that would provide the user of the **Handbook** with a list of SCANS "skills" (foundation) and the level of those "skills" required for successful entry-level employment as an electrical engineering technician. During the process of obtaining results of job analyses for achieving other objectives of the **Skills Standards and Certification Project** that were related to the **Handbook** objective, it was concluded that there was sufficient data to develop several profiles that would be of value to career counselors and administrators, and instructors and instructional material specialists of education/training programs for electrical engineering technicians.

This Handbook contains the results of occupational analysis that were conducted for the purposes of: (1) identifying instructional content in relation to the requirements of the workplace identified by SCANS research, and (2) defining the specifications for Work Keys assessments for selected workplace skills identified by SCANS research.

The process used to develop this Handbook follows:

1. The skill standards for entry-level electronic technicians were identified by the Electronic Industries Foundation's National Skill Standards Project and described in the report **RAISING THE STANDARD: Electronic Technicians Skills for Today and Tomorrow**;

2. As suggested by the Request for Proposals for these projects, the American College Testing (ACT) Work Keys *"profiling"* was used for determining the *Work Keys skill levels* for the occupation. Utilizing responses from instructors and technicians during the ACT profiling, and ideas from curriculum specialists, an analysis of skill standards was completed on task analysis forms by identifying steps/tasks or procedures necessary for performing each skill standard;

3. Utilizing the crosswalk sections from the Northeast Texas Community College's document, *"Workshop Participant Handouts"* for **Integrating Academic Skills with Technical/Vocational Instruction** written by Bill E. Lovelace, the specialists crosswalked the ACT Levels, and the SCANS levels with the Department of Labor (DOL) levels, the Texas Academic Skills Program (TASP) levels, the Community College Project levels, and the Improvement for Undergraduate Education in Texas (FIPSE) levels already established. This analysis identified:

   - Knowledge (theory, safety, materials) required to perform identified tasks;
   - Tools, equipment, materials required to perform the task;
   - Communication skills (reading, writing, listening) needed to learn and perform the task;
   - Math skills needed to learn and perform the tasks;
   - Reasoning and problem solving skills needed to learn and perform the tasks;
   - SCANS competencies essential to performing the tasks.

4. The Task Analysis Forms were then analyzed by community/technical college instructors and instructors from the Job Enhancement Program to validate the curriculum content.

The tables provided in this document include: 1) Table A: Work Keys' SCANS Occupational Profile; 2) Table B: the Crosswalks of the Work Keys' levels to the the SCANS levels, the Department of Labor (DOL) levels, the Texas Academic Skills Program (TASP) levels, the Community College Project levels, and the Improvement for Undergraduate Education in Texas (FIPSE) levels already established; 3) Table C: the identified skill standards divided into psychomotor skills (tasks); 4) Table D: the skill standards divided into cognitive skills (tasks); 5) Table E: the crosswalks (comparison) of identified levels; 6) Table F: the results of the analyses performed by consultants for the skill standards to establish the instructional content for curriculum.

Curriculum Enhancement

During the preparation of the proposal for this project, research was conducted to determine the impact of *"curriculum enhancements"* that were done by previous educational initiatives having similar, if not the same purposes as that of the Skill Standards and Certification Projects. Based on the results of that research to identify the most successful procedures for enhancing curricula to achieve long-term impact, it was determined that enhancing the curriculum should be done by enhancing existing basic course outlines or by developing basic course outlines was the most effective procedure to use.

When the proposal was submitted and approved, it stated:

> *"The curriculum enhancements, performed by consultant writers, will be done by adding curriculum deficient SCANS Skills to the basic course outline of the appropriate (related) courses of the current curriculum. By adding or including the SCANS Skills, by required level, to the basic course outlines the desired flexibility needed to assure replication and applicability across programs and institutions at the classroom levels will be assured.*
>
> *The use of the basic course outline as a vehicle or format for infusing the SCANS Skills into existing curriculum provides an opportunity to enhance curriculum in any one of the basic course outline components. For example, infusion or integration of a SCANS Skill may be most effective by including the skill in one of the objectives or instructor/student activities components of the basic course outline."*

The curriculum enhancements for the electronic engineering technicians curriculum are infused into the curriculum by the use of the basic course outlines of courses of the curriculum. This was done by using the following procedures:

1. Using the tables (analyses) developed in the **OCCUPATIONAL ANALYSIS HANDBOOK**, a comparison was made of each of the identified tasks necessary to meet the identified skill standard to the existing curriculum by the TEAM instructors and by the Job Enhancement Program (JEP) instructors using a discrepancy analysis form.

2. It was found that two barriers prevented an expeditious identification of the SCANS skills that were deficient in the existing curriculum. The first barrier was that the purpose of the SCANS job analysis was to identify workplace skills that were common or generic to many different occupations for entry level workers. Also, the SCANS research findings were not definitive in relation to the "entry-level" workers. The second barrier that surfaced in the identification of the deficiencies of SCANS skills in the curriculum was the lack of detail found in the description of the instructional content of the existing curricula. It was found that the highest level of detail of instructional content that existed was that of course syllabi in relation to the TEAM curricula. It was determined by the instructors who were assigned the responsibility of identifying the SCANS skills that were not included in the curriculum, that the skills **were being applied but had not been documented as a skill to be developed.** Course syllabi do not provide for this level or detail of description of instructional content. Individual interviews with instructors revealed that the SCANS skills

were being taught and applied in the curriculum as a result of their personal knowledge of what an electronic engineering technician must **"know"** and **"do"**. Therefore, the "curriculum enhancement" of this project are not what SCANS skills must be added to or integrated into the existing curriculum, but examples of how documentation can be made that the SCANS skills are being applied and taught if not previously acquired by students in the existing curriculum.

3. The curriculum enhancements were developed on the premise that the SCANS Skills are generic to many occupations, are core content, and should be prerequisite to technical instruction. The curriculum enhancements are presented in the format of a basic course outline. The format of a basic course outline was selected because it provides for enough detail to provide for:

    - Name of Course
    - The identification of the unit of instruction
    - The instructional objective written in performance terms
    - Enabling objectives if needed
    - A listing of instructor and student activities
    - Modes of instructional delivery
    - References
    - Equipment/supplies
    - Evaluation (knowledge assessments/performance assessments)

The enhancements presented in the document show an integration of the SCANS Skills in a variety of ways. In some cases, the SCANS competencies are: taught and applied;

reviewed and applied; and only applied. The SCANS foundation enhancements (JEP) provide a description of how the foundations are taught in context.

Assessment and Certification Strategies

One of the products to be produced by the **Skills Standards and Certification Projects** was a ***"Testing and Certification Strategies Document."*** The purpose and content of the document as stated in the RFP were to *"recommend approaches and strategies for how training institutions and businesses might enhance current testing and certification methods by incorporating the products of this project."*

Since time and resources available to the project did not provide an opportunity for in-depth research to meet the specifications of the RFP, a review of the literature was the basic tool used for obtaining information to be used in the preparation of this document. A review of the literature was done to:

(1) identify entities that offered a certification for electronic engineering technicians, provided occupational competency examinations for electronic engineering technicians, and provide for the accreditation of electrical engineering programs;

(2) identify issues and concerns related to assessment of skill standards (work place requirements) and certification of individuals completing an electronics engineering technician program; and

(3) identifying current testing instruments used by Texas public community and technical colleges to asses this attainment of the technical competencies and SCANS competencies by students.

Concurrently with the duration of this project the project staff had the opportunity to participate in focus groups convened by Texas Instruments and the Electronics Industries Foundation for the **National Skills Standards Development Project for Basic Electronics.** As with this project, the National Skills Standards Project for Basic Electronics is addressing the topic of certification. Addressing the topic of certification of technicians has brought about the issue of ***"certification or accreditation".*** As participants in one such focus group, the project staff received copies of the responses from the participants which included approximately twenty-six (26) educators who were predominately instructors of postsecondary electronic programs and approximately twenty-one (21) practicing electronic technicians/supervisors/employers.

Based on the research findings and the summary of the Dallas Focus Group, the following was determined in reference to certification:

1. electronic training programs should be accredited on a national basis by a voluntary non-governmental agency;
2. electronic technicians should be certified on a national basis by a voluntary non-governmental organization;
3. the certification of electronic technicians should be based on the assessed attainment of skill standards validated by business/industry;
4. electronic technician programs should be taught only by instructors who are certified as electronic technicians;
5. certification exams should include an assessment of cognitive and psychomotor skills, and;
6. electronic technician preparation programs should use "hands-on proficiency" testing during training;
7. certification of electronic technicians and accreditation of electronic technician programs should be one of a national basis by a non-governmental agency/organization.

The only certification organizations/agencies for electronic technicians identified through the project research included: a) the Electronic Technicians Association (ETA); b) the National Electronic Sales and Service Dealers Association; and c) the International Society of Certified Electronic Technicians.

In reference to assessment, the project staff did extensive research and determined the following:

1. The mandates by national and state acts and policies advocates the use of competency-based curricula and instruction with the following guidelines provided by the Texas Higher Education Coordinating Board in the **TECHNICAL AND VOCATIONAL PROGRAM GUIDELINES - 1989**:

   Competency-based education is designed to teach job related clusters of skills and knowledge, the mastery of which forms the basis upon which the student is evaluated; competency-based programs must possess the following characteristics:

   1. Involvement of business and industry in the determination of the job competencies and the expected performance level required for successful employment within a defined job or cluster of jobs.

   2. Course sequence which allows the mastery of competencies leading to the satisfactory performance of all identified competencies.

Also, in the report of the **STATE ASSESSMENT**, for **Section 116** of the **Carl D. Perkins Act II**, prepared by the Texas Higher Education Coordinating Board, there were two recommendations made for **Criteria Factor II: Sequential courses or study leading to both academic and occupational competencies are:**

3. Public community colleges and technical institutes should develop a periodic review process to ensure that applied basic work skills are incorporated into the curriculum of each technical program.

4. Public community colleges and technical institutes should develop a periodic assessment to ensure that competency-based instruction is incorporated in all programs.

The achievement of recommendation "4" stated above requires the development of a model for developing and administering competency exams that can be used by individual institutions for the periodic assessment of competency-based instruction. The use of a *competency-based instruction system* has been found to be the best vehicle by which to deliver *competency-based applied learning*. The use of a competency-based instruction system (CBI) provides for measuring both student learning (progress) and competency attainment (proficiency).

Through research, the project staff determined that the Texas Higher Education Coordinating Board had funded a project to Paris Junior College to develop a model for developing and administering occupational competency exams. The model for developing occupational competency exams uses only performance exams. The use of only performance exams for program exit measures was based on the premise that cognitive skills and technical knowledge needed to perform the competency or skill standards could be measured in a properly prepared performance exam.

Discussions with instructors of Electronic Technician programs revealed that current testing instruments used by public Texas community and technical colleges are more appropriate and used for evaluating student progress than for assessment of student attainment of industry identified skill standards and competencies. This determination was made on the basis that criteria used in assessing performance of the skill standard had not been obtained and/or validated by representatives of business/industry.

The review of the literature also revealed that the **National Occupational Competency Testing Institute** is the only recognized national organization that has prepared and disseminates student occupational competency achievement tests designed as exit measures for completers of vocational/technical education programs.

Staff Development Plan

The purpose of the Skill Standards and Certification Projects sponsored by the Texas Tri-Agency Partnership as stated in the RFP: ***". . . is to improve the strategies for delivery of education, training, and support services so that students are equipped with technical and SCANS skills needed for successful employment in the modern workplace."*** In order to determine the best procedures or plan to achieve this purpose, the project staff did extensive research of all studies previously completed on staff development including in-service, pre-service and teacher education processes. The achievement of the above stated purpose and for the products of the project to have the greatest impact, it was determined from the research that it will be necessary for a comprehensive professional development plan to be developed and implemented on a state-wide basis. The professional development plan must provide for the development of the skills and knowledge needed by **all educators** to achieve the above stated purpose of the Skill Standards and Certification Projects.

The professional development plan to develop and achieve the previously stated purpose must be **holistic** in nature, meet the needs of all stakeholders, and be delivered in a manner that eliminates barriers that prevent access to all who need and desire to participate in professional improvement activities.

The professional development proposed by this project is based on the following: **(1) that professional development consists of professional preparation and professional improvement; (2) that instructional content for professional preparation curricula should be based on skill standards derived from the workplace; (3) that professional improvement should provide for meeting the individual needs for improvement based on the new educational technologies, educational initiatives, new education legislation, additional preparation needs of individuals who move horizontally or vertically in the field of education; (4) thatprofessional preparation may be acquired on both a pre-service or in-service structure; and (5) that professional improvement may include the acquisition of new knowledge and the develop-ment of new skills and related knowledge required to develop and perform the new skills.**

The professional development plan for meeting the purpose of the Skill Standards and Certification Projects must be long range in nature. The components and procedures for implementing the project plan are described in the following narrative.

A. Identification of personnel who will be involved in programs/activities essential to achieve the goal or purpose of the initiative.

    (1) Identify the classification of personnel who must be involved;

    (2) Establish the role of each classification of personnel involved;

    (3) Determine if the professional development will be preparation, improvement, or both based on the classification of personnel involved with the initiative.

B. Determine if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge.

C. Identify what knowledge and skills are prerequisite to the objective or purpose of the staff development activity being planned.

D. Analyze the skill(s) to be taught to identify and sequence instructional content.

E. Estimate time required for delivery of instruction.

F. Develop assessment instruments to determine if training participants developed/attained skills and knowledge that were taught.

G. Estimate time required for assessments.

H. Develop basic course outline for instruction (working agenda for a one or two day workshop/ conference).

I. Select time(s) and place(s) for delivery of instruction.

J. Select and train instructors to deliver instructions.

K. Publicize staff development activity and obtain registration of participants.

L. Evaluate instruction (staff development activity): (1) on-site; (2) follow-up.

It is recommended that any professional development programs, workshops, or activities that are conducted to make potential users of the project products aware of the product and how they could be used should observe the components of the above plan.

An analysis of the skills needed most by faculty, instructors, and other professional staff to deliver enhanced curriculum that infuses SCANS skills revealed a variety of prerequisite skills and knowledge (skill standards for educators). The prerequisite skills included the knowledge and skills required by the project staff and consultants to complete this project. The prerequisite skills/knowledge included those required for:

- Developing a competency-based curriculum;
- Developing definitive (basic) course outlines;
- Developing instructional content and related instructional materials;
- Writing instructional and student outcome objectives in performance terms;
- Developing and administering criterion-referenced cognitive and performance tests.

The limitation of the time and budget did not provide an opportunity for an assessment (item C of the plan) of individuals to be provided with staff development to identify to what extent they were ready by experience and training to benefit from the staff development objective of the project. Any staff development program or activity planned and conducted without identifying the prerequisite skills of the proposed participants should be done for the purpose of awareness.

III. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

From the research completed by the project staff and the development of the stated required documents for this project, the following summary, conclusions and recommendations were made:

Summary

In order to meet the previously state purpose of the project, the original Request for Proposals identified the projects as two year projects. The first year was shortened for all four projects by delays in the established process which determined the use of the ACT Work Keys and profiling process. The documents were completed even with the delays, and recommendations for a second year of funding have been made to provide the staff development activities and for further distribution of the documents with training and is under consideration by the funding agencies. However, the documents developed by this project can be used in the following ways if additional funding is not provided:

A. Occupational Analysis Handbook

The Handbook provides a basis for the development of new curricula or for the enhancement of existing curricula and instructional content for the preparation of electronic engineering technicians. The degree to which the Handbook can be used for the purposes for which it was developed will be directly dependent on the educational preparation and experience of each user in curriculum, instructional content, and assessment development. Individuals who have not developed skills and knowledge (skill standards) needed for developing, implementing, and assessing competency-based instructional systems will be unable to effectively use the Handbook to achieve the purposes for which it was developed.
However, some uses can be made as follows:

1. Demonstration of how skill standards can be used by educators;

2. Demonstration of how business/industry can use the method for identifying levels and to identify skill standards' requirements in curriculum/training programs;

3. Could be used by state leadership to do staff development in the "how to" process;

4. With staff development/training, could be used by educators including counselors and teachers to better recruit, screen, and train students as well as provide a total transition plan or career pathway (Career Majors) for students in particular fields of study.

B. Curriculum Enhancement

The concept of the basic course outline and examples of such outlines in this document can be used by any educator including academic instructors as a model to follow to ensure that all skills and competencies are included in the curriculum being used as the basic course outline becomes a part of the curriculum and is not an "add-on" which would be external and not an enhancement on a permanent basis.

C. Assessment and Certification Strategies

This document can be used by business/industry, instructors of electronic engineering programs, and by the leadership of state agencies and institutions to identify assessment and certification trends as well as current agencies/organizations involved in the certification of electronic technicians. Also, information as to stated mandates from national and state acts or policies is summarized for use in this document.

D. Staff Development Plan

This document can be used by the state leadership and the local institutional leadership to identify the following:

1. A summary of state and federal references to staff development;
2. A researched clarification as to staff development, in-service, and pre-service;
3. A basic staff development design/model; and
4. The basic characteristics of a staff development plan.

Conclusions

Based on the review of the SCANS research needed to complete this project and the research conducted on each topic identified by each document required, and with the input from the business/industry participants, the instructors of the programs involved, and the processes and procedures followed during this project's completion, the following conclusions were made by the project staff:

1. The basic course outline is the most recommended tool for curriculum enhancement identified in the research to ensure inclusion of the enhancements into the curriculum rather than the enhancements being "add-ons";
2. The ***"SCANS Skills"*** are skills that are common or generic to many jobs or occupations in the workplace;
3. The ***"SCANS Skills"*** are not the skill standard (technical skills) of occupations in the work place;
4. The ***"SCANS Skills"*** should be considered as core to the occupational curricula and should be prerequisite to the technical courses;
5. Technical instructors should require that the ***"SCANS Skills"*** are performed proficiently in learning/developing the skill standards of the workplace; and

6. Intensive staff development will be needed by curriculum developers, developers of instructional materials, and instructors if the SCANS Skills are to be included in the curriculum of all technical (occupational) preparation programs.

7. Occupational preparation programs' accountability has been mandated for programs that use public funds;

8. A National Skill Standards Board is to be established to stimulate and support the adoption of a voluntary national system to assist in carrying out the mandate for accountability;

9. The assessment and test instruments currently being used by public community and technical colleges in Texas are not appropriate for use as exit measures for program completers;

10. The availability of commercially prepared assessment instruments designed as exit measures of skill standards is limited;

11. Assessment or test instruments are needed for evaluating student progress and competency attainment; and

12. Electronic instructors should be provided training in the development and administration of occupational competency/skill standards exams.

13. A staff development program should be designed to include the following:

    - **To be based on the assessed professional improvement needs of existing staff members and the assessed professional preparation of new staff;**

    - **To meet the needs of staff of all state agencies and local entities approving and/or (1) designing curriculum; (2) delivering instruction of the curricula; and (3) providing career guidance and support services to individuals preparing to enter, pursuing, and completing occupational preparation programs/courses;**

    - **To upgrade and/or prepare "trainers of trainers";**

    - **To provide staff development at the time and place convenient to the targeted staff;**

Recommendations

As referenced and documented previously in this document, the research conducted by this project has provided for enough background for the project staff to make the following recommendations for consideration by the staff of the Texas Skills Development Program of the Texas Department of Commerce, the Community and Technical Colleges Division of the Texas Higher Education Coordinating Board, and the Career and Technology Division of the Texas Education Agency:

1. It is recommended that the state leadership, utilizing the documents from the Skills Standards and Certification Projects, provide specific definitions and terminology relating to SCANS research and skills and skill standards to avoid terminology differences among and between personnel from educational agencies/institutions at all levels and business/industry;

2. It is recommended that the state leadership, utilizing the documents from these projects, identify a specific curriculum design (format) to be used by educators to ensure that all elements for the specified training will be included in the program(s);

3. It is recommended that the appropriate State agencies fund staff development activities that will provide postsecondary electronic instructors with instructional design to:

   a) prepare them to deliver the electronic technician curricula using a competency-based instructional system;

   b) develop and administer occupational competency exams; and

   c) update the technical skills and knowledge of the instructors.

4. It is recommended that the electronic engineering technician curricula be enhanced by the development of basic course outlines to provide for a greater assurance that the SCANS competencies and foundations are included in courses that are a core for the electronic curricula in all Texas public community and technical colleges.

5. It is recommended that a project be funded to initiate the development of assessment instruments, using the model developed by Paris Junior College, that will measure the development of the skill standards and the SCANS skills of the electronic engineering technician curriculum in Texas public postsecondary programs.

6. It is recommended that financial resources currently available at the state level to design, implement, evaluate, and maintain a comprehensive statewide program of staff development for all individuals having governance and/or the responsibility of public occupational (career) preparation and retraining programs and selected services in Texas be used to provide the training necessary to meet the purpose of the Skill Standards and Certification Projects.

7. It is recommended that any such staff development be long range and holistic in nature using the stated components and procedures of this project plan and one which incorporates the findings and materials of the four Skill Standards and Certification Projects that can be provide professional development and training for teachers, counselors, workplace trainers and monitors, administrators and supervisors.

8. It is recommended that staff development and/or technical assistance be provided, where/when necessary to provide the prerequisite skills/knowledge required for infusing SCANS into the curriculum as identified by the project staff;

9. It is recommended that encouragement and assistance be provided to state teacher education institutions to increase their capacity to provide for the professional improvement needs of future and current career and technical personnel especially in relation to skill standards and SCANS skills;

10. It is recommended that the results of these projects be utilized to determine and provide leadership which would result in horizontal and vertical curriculum based on skill standards and including SCANS skills that develops a career pathway with a coherent sequence of courses for students beginning at the secondary level leading to entry-level employment in the chosen career major;

11. It is recommended that a state technical/vocational personnel development advisory committee (focus group) be created and used which will be representative of the personnel to be served, to advise and assist the state staff in providing state leadership and administration of career and technical staff development programs and activities especially in relation to skill standards, SCANS skills, and the curriculum enhancements.

OCCUPATIONAL ANALYSIS HANDBOOK
for
ELECTRICAL ENGINEERING TECHNICIANS

TEXAS SKILLS STANDARDS AND CERTIFICATION PROJECT

by

TEXAS INSTRUMENTS

and

The University of North Texas

with support from

THE ELECTRONICS INDUSTRY FOUNDATION

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PREFACE

The ***OCCUPATIONAL ANALYSIS HANDBOOK FOR ELECTRICAL ENGINEERING TECHNICIANS*** provides a description of the national and Texas initiative for building a world class competitive work force using education and training programs that are driven by industry via *National Skill Standards* and *SCANS* and the *Texas Skill Standards and Certification Projects.*

The **Handbook** describes the procedures for developing and the potential uses of a **SCANS Occupational Profile.** The **Handbook** also presents other occupational profiles for the electrical engineering technician that will be of value in restructuring and/or enhancing the technical curriculum through the integration or inclusion of the SCANS skills and the National Skill Standards into the existing technical curricula.

The ***OCCUPATIONAL ANALYSIS HANDBOOK*** is one of four Occupational Handbooks resulting from the *Texas Skill Standards and Certification Projects.*

With the partnership of Texas' business, labor, industry, and education, the **Tri-Agency Partnership** is committed to continue its efforts to build a Texas world class work force.

■ **Background:**

The report, **BUILDING A QUALITY WORKFORCE**, states that ***"Our nation is experiencing a widening gap between workplace needs and workplace capabilities, and we need to address this mismatch between the needs of business and the skills of young people leaving our schools."*** Since the dissemination of **BUILDING A QUALITY WORKFORCE** in 1988 which was a joint initiative of the U.S. Department of Labor, U.S. Department of Education, and the U.S. Department of Commerce, several reports and congressional Acts have occurred that are anticipated to close the ***"gap"*** and keep our nation competitive in a global economy.

In the major study, **WORKFORCE 2000, WORK AND WORKERS FOR THE 21ST CENTURY**, conducted jointly by the Hudson Institute and the Department of Labor, the following statement was made:

> ***"When jobs are given numerical ratings according to the math, language and reasoning skills they require, only 27 percent of all new jobs fall into the lowest two skill categories, while 40 percent of current jobs require these limited skills. By contrast, 41 percent of new jobs are in the three highest skill groups, compared to only 24 percent of current jobs."***

The implication? The current curricula of our educational institutions that are preparing students for the work force **do not include the increasing educational and skill requirements** of the workplace. The **WORKFORCE 2000** report stated:

> ***". . . Education levels, of course, are only a rough proxy for the skills required for employment. But more detailed analysis of the language, math and reasoning skills required for various jobs reinforces the conclusion that the skill mix of the U.S. economy will rise substantially between now and the end of the century . . . ."***

President George Bush released **AMERICA 2000: An Education Strategy** on April 18, 1991. **"America 2000"** has been referred to as ***"a bold, complex, and long-range plan to move every community in America toward the national education goals adopted by the President and the governors last year [1990]."*** The **"America 2000"** strategy includes four parts. In **Part III. For the Rest of Us (yesterday's students/today's work force): A Nation of Students** it is specifically proposed that: "*Business and labor will be asked to adopt a strategy to establish job-related (and industry specific) skill standards, built around core proficiencies, and to develop 'skill certificates' to accompany these standards.*"

It is proposed in this strategy that such efforts be informed of the work of the Department of Labor's **Commission on Work-Based Learning** and the **Secretary's Commission on Achieving Necessary Skills.**

"The term 'skill certificate' means a portable, industry-recognized credential issued by a School-to-Work Opportunities program under an approved State plan, that certifies that a student has mastered skills at levels that are at least as challenging as skill standards endorsed by the National Skill Standards Board established under the National Skill Standards Act of 1994, except that until such skill standards are developed, the term 'skill certificate' means a credential issued under a process described in the approved State plan."

CONFERENCE REPORT
[To accompany H.R.2884]

As a result of the need for our nation to be competitive in a world economy and the rapid increase of technology on the job, the **Secretary's Commission on Achieving Necessary Skills (SCANS)** was asked to identify the **requirements of the workplace for entry level employees.** Specifically, the Commission was asked to:

- **Define the skills needed for employment;**
- **Propose acceptable levels of proficiency;**
- **Suggest effective ways to assess proficiency; and**
- **Develop a dissemination strategy for the nation's schools, businesses, and homes.**

In the "*Executive Summary*" of **WHAT WORK REQUIRES OF SCHOOLS, A SCANS REPORT FOR AMERICA 2000,** it is stated:

> ***"SCANS research verifies that what we call 'workplace know-how' defines effective job performance today. This know-know has two elements: 'competencies' and a 'foundation' . . . . Thus, the competencies and foundations should be taught and understood in an integrated fashion that reflects the workplace 'contexts' in which they are applied."***
>
> ***"The competencies differ from a persons technical knowledge. For example, both accountants and engineers manage resources, information, systems, and technology. They require competence in these areas even though building a bridge has little to do with balancing a set of books."***

The report, "*SKILLS AND TASKS FOR JOBS*", issued by the Secretary's Commission on Achieving Necessary Skills was ***"designed to help educators make high school courses more relevant to the needs of a modern workforce and to help employers ensure that their employees possess appropriate, up-to-date skills."*** The SCANS research identified two types of skills: competencies and foundations.

The SCANS report referenced above stated: "*competencies are the skills necessary for success in the workplace and are organized into five areas. Foundations are skills and qualities that underlie the competencies. The competencies and foundatons are* ***generic-most of them are required for most jobs."***

Congress, in framing Public Law 101-392 (Perkins Amendments 1990), being aware that the requirements of the workplace must be the base for developing instructional content for preparing competent, entry level workers included "*Section 416. Development of Business and Education Standards*" in the Act. **Section 416** states:

> ***"(2) The committees established with assistance under this section shall propose national standards for competencies in industries and trades. Such standards shall at least include standards for -***
>
> ***(A) major divisions or specialty areas identified within occupations studies;***

> (B) ***minimum hours of study to be competent in such divisions or specialty areas;***
>
> (C) ***minimum tools and equipment required in such divisions or specialty areas;***
>
> (D) ***minimum qualifications for instructional staff; and***
>
> (E) ***minimum tasks to be included in any course of study purporting to prepare individuals for work in such divisions or specialty areas."***

More than twenty "*National Skills Standards*" projects are being conducted under the provisions of Section 416 of Public Law 101-392. The **Electronic Industries Foundation** of Washington, D.C. is conducting a project to develop or identify national skills standards for entry level electrical engineering technicians.

In Texas, the **Texas Department of Commerce** took an early lead of promoting an **industry driven skill standards and certification system** as a key strategy for assisting Texas in building a world competitive work force. In the ***"Preface"*** of the report to the Governor of the **TEXAS SKILLS DEVELOPMENT PROGRAM,** Barbara Cigarnaro stated:

> ***"Acknowledgement of Texas' business and industry concerns has caused our current research to delve into methods and strategies that would connect the foundation skills with occupational-technical skills. The challenge ahead is to integrate academic and vocational-technical training, establish clear career path options and develop a work force preparation system that meets employers' needs."***

One of the strategies being used to connect the foundation skills with occupational-technical skills is the funding of four ***Skill Standards and Certification Projects*** in Texas. The **purpose** of the first year of the stated projects is ***"to build a viable method for integrating SCANS skills into the technical training curricula in Texas so that students will be able to apply SCANS skills along with state-of-the-art technical skills."***

> "High-performance workplaces . . . require . . . the ability to manage resources, to work amicably and productively with others, to acquire and use information, to master complex systems, and to work with a variety of technologies."
>
> LEARNING A LIVING: A Blueprint for High Performance

This project will assist in bringing about a needed systemwide **reform of public educational institutions who have a responsibility** for assisting in developing a quality work force that is competitive in a global economy. Statewide reforms include five key components: **1) Skills Standards (including SCANS) by occupations identified and/or validated by the workplace; 2) curricula developed based on the skills standards; 3) high quality instructional materials, facilities, and equipment; 4) faculty highly qualified by subject mastery and professional development; and 5) student assessments in formative and summative modes and tied to the workplace requirements via the curriculum.**

■ **Concerns and Issues:**

A review of the literature reveals that as with other reform movements or efforts to improve education and ultimately the national workforce, confusion occurs due to a lack of common terminology. Common or core terms of references and understandings are imperative if the skills standards and certification initiatives are to be successful.

Following are examples of terminology issues that have surfaced during the research performed prior to the preparation of this Handbook:

- **certification:** maybe used to recognize or document that an individual has completed or achieved the requirements of an activity or objective with established minimum requirements and is awarded by the entity establishing the requirements for the certificate. **Certification** is usually performed by voluntary or non-governmental agencies. **Certification** is sometimes used instead of licensure by governmental agencies such as teacher certification.

- **curriculum:** referred to as a systematic group of courses or sequences of courses required for graduation or certification for a career objective. **Curriculum** is sometimes used to mean the instructional content of a subject area.

- **job:** the word "*job*" had different meanings depending on when, how, or by whom it is used. **Job** is often used interchangeably with the words "*occupation*", "*position*", "*function*", and "*task*".

- **Skill:** is referring to the ability to perform a mental or psychomotor performance. The terms "*skill*" and "*ability*" are used synonymously. The terms "*task*", "*operation*", and "*competency*" are sometimes used as being synonymous with the word "*skill*".

- **occupational analysis:** the terms "*job analysis*", "*task analysis*", and "*work analysis*" are often used synonymously.

- **outcome:** something that follows as a result or consequence. A change in behavior is an **outcome** which could be positive or negative. In education and training **outcomes** should be stated in performance terms.

- **performance:** the execution of an action

- **performance test:** used narrowly to refer to the demonstration of ability and used broadly when referring to any type of psychomotor assessment.

- **standard:** defined in PL 101-392 as the level or rate of an outcome. The word is used correctly in terms of institutional standards, industry standards, and program standards when reference is used in relation to minimum requirements of knowledge, skills, and attitudes that must be demonstrated or performed.

  The word **standard** is also used correctly when it is used to describe the level or degree of an established measure.

- **standard, Job-Related Industry Skill:** defined by the U.S. Departments of Labor and Education in 1992 as "*Generally, is the identification of knowledge, skill, and level of ability needed to satisfactorily perform a given job.*"

- **skill standards:** referenced above as "*job-related industry skill*"; used synonymously by educators and trainers as workplace requirements, competencies, and outcomes of technical and vocational education.

■ Job Analysis

Job analyses are the basic processes for obtaining information needed for the development of the instructional content of curricula designed to prepare individuals for entry level employment in an occupation (a cluster of jobs) or cluster of occupations. Information obtained from a job analysis may also be used for:

- **developing job descriptions;**
- **creating and maintaining job selection and promotion systems;**
- **establishing job classifications and pay scales;**
- **conducting employee evaluations of job performance in terms of productivity (efficiency and effectiveness).**

A review of the literature reveals that these are several job analysis techniques that have a series of specified procedures for obtaining and analyzing information about specific jobs. Specific job analysis techniques that have been recognized nationally as proven systems include: Functional Job Analysis ; Critical Incident Technique; Position Analysis Questionnaire; Job Element Analysis; CODAP Task Inventory Analysis; and DACUM. A review of the task inventories developed using CODAP revealed that the five competencies developed by SCANS have been included in the task inventories for years. Also American College Testing (ACT) has developed a "*Job Profiling Technique*" for "*Work Keys*".

According to literature disseminated by ACT: "*The Work Keys System has two fundamental tasks: (1) to build a metric that will measure an individual's workplace skills against the requirements of a particular job, and (2) to facilitate instruction that will enable that individual to improve skills where necessary.*"

"Learning in order to know" should not be separated from "learning in order to do."

LEARNING A LIVING: A Blueprint for High Performance

Different methods of collecting and treating occupational information by purposes of the analysis has created the above different job analysis techniques referenced above. There were differencies in the job analysis techniques used by SCANS and the techniques used in traditional job analysis. "*The goals of the modified SCANS analysis were to evaluate the adequacy of the skill definitions, to demonstrate the level of importance of the skills in a sample of jobs, to identify specific job* *tasks that illustrate the use of the skills, and to collect information for assessment and training.*"[1] It has been observed that even with different methods, analysis conducted for developing training or education programs has a core of common products and procedures. In analyzing the requirements (standards) of the workplace for instructional purposes the analysis must identify what the entry level worker must "do" and what the worker must "know" in order to perform the "doing". Therefore the common processes of analysis for instructional purpose include, as a minimum, the following:

- establish and validate an inventory of job tasks (standards) by duty or function areas
- analyze each task for instructional content to identify:
  - steps or procedures for performing each task
  - knowledge (theory, safety, materials) required to perform each task
  - tools, equipment, materials required to perform the task
  - communication skills (reading, writing, listening) needed to learn and perform task
  - math skills needed to learn and perform the task
  - reasoning and problem solving skills needed to learn and perform tasks
  - SCANS competencies essential to performing the task. In some cases, the SCANS competencies may be a job task of the duty or function area.

After all of the instructional content has been identified, it becomes the responsibility of the instructor or instructional materials specialist to arrange the instructional content into a delivery sequence of "easy" to "difficult" and/or "simple" to "complex".

---

[1] **SCANS, Skills and Tasks for Jobs,** 1992, U.S. Department of Labor.

"Imparting SCANS skills is not so much about curriculum as pedagogy: How instruction is delivered as opposed to what specifically is taught."

Steffen Palko, Member of Secretary's Commission on Achieving Necessary Skills

If an occupational preparation program has been designed by clustering occupations having similar tasks/competencies and results, the task inventories of each occupation/job in the program cluster should be compared to determine if a career ladder(s) is identified.

The identification of career ladders in a certificate or associate degree program designed for a cluster of occupations will be made easier when occupational or job profiles are developed.

■ Scans Occupational Profile for Electrical Engineering Technicians

The word **profile** has been defined to include the meaning "*a set of data often in graphics or outline format to portray the significant features of something.*" Therefore, an occupation or job could have various profiles based on the types of data being presented by the profile and the proposed use of the profile. A task inventory could be classified as one kind of occupational or job profile.

SCANS FOUNDATIONS:

Basic skills: reading, writing, mathematics, listening, and speaking;
Thinking Skills: creative thinking, decision making, problem solving, ability to visualize, knowing how to learn, and reasoning;
Personal Qualities: responsibility, self-esteem, sociability, self-management, integrity, honesty

SCANS COMPETENCIES:

Resources: the ability to identify, organize, plan and allocate resources;
Interpersonal: the ability to work with others;
Information: the ability to acquire and use information;
Systems: the ability to understand and work effectively within complex inter-relationships;
Technology: the ability to work with a variety of technologies.

The primary purpose of this **Handbook** was to develop a scale (profile) that would provide the user of the **Handbook** with a list of SCANS "skills" (foundation) and the level of those "skills" required for successful entry-level employment as an electrical engineering technician. During the process of obtaining results of job analyses for achieving other objectives of the **Skills Standards and Certification Project** that were related to the **Handbook** objectives, it was concluded that the Handbook should be expanded to include other information obtained by the analysis that would be of value to career counselors and administrators, and instructors and instructional material specialists of education/training programs for electrical engineering technicians.

PROCESS

The **Request for Proposals** for the **Skill Standards and Certification Projects,** issued by the Tri-Agency Partnership, stated in reference to developing a SCANS occupational profile: "*there is no SCANS scale that has been developed to date for addressing each SCANS skill area. Therefore, applicants may select the ACT Work Keys scale (See Attachment VIII) to use as a basis to determine the SCANS skills necessary for successful entry-level employment in the specific occupation.*"

The occupation (job) analysis procedures or techniques used by ACT to develop an ACT "*Work Keys Profile*" for the occupation of Electrical Engineering Technician was very appropriate for determining the "*Work Keys*" skill levels of the occupation. In order to achieve the goals and objectives of the Skills Standards and Certification Project, it was determined by the project staff and consultants, that the occupational analysis conducted by SCANS and ACT had to be expanded.

This Handbook contains the results of occupational analyses that were conducted for the purpose of: (1) identifying instructional content in relation to the requirements of the workplace identified by SCANS research, and (2) defining the specifications for Work Keys assessments for selected workplace skills identified by SCANS.

The SCANS Occupational Profile for the occupation of Electrical Engineering Technician prepared by American College Testing (ACT) is presented in **Table A.** The

ACT ***"job profiling"*** appears to be a term coined by ACT to describe a job analysis technique that may be specific to conducting a job (occupational) analysis for identifying specifications for developing assessment instruments and scales for evaluating an individual's cognitive workplace skills. A more detailed description of the ACT job profiling technique may be found in **Appendix I (Attachment VIII).**

In observing the ACT "*job profiling*" process conducted at Texas Instruments, it was not evident in their process that the survey information collected from the employees was ever validated for accuracy by supervisors. The ACT Profile, therefore, remained high because the employees surveyed were long-term employees who were not reminded that the survey questions related specifically to **entry level skills required.** There was also a concern through the ACT process that the site tour (visual observations at the job site) was not tied to any task identified in the survey documents or in the ACT process. These points need to be noted by anyone using only the *ACT Work Keys Profile for Electrical Engineering Technicians* for revision or enhancement of curricula and/or instructional materials.

The results of the job profiling (analysis) conducted by ACT for the occupation of Electrical Engineering Technician using a Work Keys scale were compared to: (1) the workplace "*competencies*" and "*foundations*" identified by SCANS research and (2) previous analyses conducted by the U.S. Department of Labor. The results of the comparisons are shown in **Table B**. A review of Table B reveals that the job analysis (profiling) conducted by ACT using a "*scale*" to assess "*levels*" of SCANS skills was done for those skills that are considered as being predominately in the cognitive domain.

One of the outcomes of the Skills Standards and Certification Project as stated in the Request for Proposals (RFP) was "*Enhancements to the curriculum that infuses SCANS skill training into the technical components.*" The RFP also stated: "*The purpose of the first year* *projects is to build a viable method for integrating SCANS skills into the technical training curricula in Texas so that students will be able to apply the SCANS skills along with the state-of-the-art technical skills.*"

To achieve this purpose, it became necessary to use job analysis specifically to identify instructional content of a curriculum developed for preparing individuals with workplace entry-level requirements for the occupation of electrical engineering technicians. The process of job analysis for instructional purposes previously outlined was used by this project. The following narrative describes what was done to identify the instructional content in relation to the job analysis process previously outlined.

1. Establish and validate an inventory of job tasks (skill standards) by duty or function areas of the occupation.

   It was agreed by Texas Instruments, the Electronics Industries Foundation (EIF), and the University of North Texas that the skill standards developed by EIF and the Electronics Industries Association would provide for the job analysis phase "*Establish and validate an inventory of job tasks (skill standards) by duty or function areas of the occupation.*"

   It was observed that the job analysis conducted by the Electronic Industries Foundation and the Electronic Industries Association used a variety of techniques of different job analysis procedures known to be used for identifying instructional content. A description of the procedures used for developing the National Skill Standards for the Electronic Engineering Technician are described in the report **RAISING THE STANDARD: Electronic Technicians Skills for Today and Tomorrow, by the Electronic Industries Foundation, Washington D.C., 1994.**

The draft skill standards (tasks) developed (identified) and validated by the Electronic Industries Foundation's National Skill Standards Project are presented in **Tables C and D.** Table C provides a list of the psychomotor skills (tasks) that an entry level electronic engineering technician must be able to do in terms of functions or duties indicated as *Fabricate and Demonstrate*" and "*Troubleshoot and Repair*".

Table D provides a list of the draft of the technical skills (cognitive) that an entry level electronics engineering technician must know to perform the required psychomotor skills and are listed as "*Demonstrate and understanding of* . . ." and "*Understand principles and operations of* . . . ".

2. Analyze each task for instructional purposes to identify:
   - Academic skills needed to learn and perform each task
     - Communication skills
     - Math skills

American College Testing provided the most recent data on the communication and math skills and required levels for entry level electronic engineering technicians.

The identification of the communication and math skills needed are essential for the development of the curriculum and instructional content of any occupational preparation program. However, the results of any job analysis must be disseminated in a manner that is useful to potential users. Most of the educators who reviewed the results of the work keys job profiling conducted by ACT did not see the relationship of the ACT findings (skills and levels) to the existing curriculum.

To make the ACT profiling more meaningful to educators, especially those responsible for developing and/or revising curricula, project staff utilized a previously developed crosswalk of communication and math skills[2] to show the relationship of ACT's Work Keys to similar data understood by community college personnel.

The crosswalk of the math and communication skills is presented in **Table E.** Table E presents the crosswalk of levels identified by the Northeast Texas Community College project including the Department of Labor, the Texas Academic Skills Program, and the community college levels with the ACT levels and SCANS[3] as added by the project specialists. Table E provides an easy interpretation of the ACT Work Keys levels by community and technical college personnel who are responsible for course development in relation to the Texas Academic Skills Program (TASP), the "*Improvement for Undergraduate Education in Texas*", and the results of the Texas Higher

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Adapted from the crosswalk sections of **"Workshop Participants Handouts for Integrating Academic Skills with Technical/Vocational Instruction",** Bill E. Lovelace, Northeast Texas Community College, Texas, 1991.

SCANS, Skills and Tasks for Jobs, U.S. Department of Labor.

Education Coordinating Board's research for identifying academic skills essential to preparing for and entering employment in occupations requiring less than four years of college.

The crosswalk can be used by developers of curricula to assure that the academic skills that are prerequisite to entering an occupational program or that should be developed concurrently with occupational skills are included in courses of the curriculum. As a career guidance tool, the crosswalk may be used by students and career counselors in determining what communication and math skills and the level of those skills are required by the occupation.

The crosswalk may also be used to show English and math teachers the level of skills needed by individuals preparing to become electronic engineering technicians.

Other task analysis activities performed to determine instructional content included the identification of:

- Steps or procedures for performing each task;
- Knowledge (theory, safety, materials) required to perform the identified tasks;
- Tools, equipment, materials required to perform the task;
- Communication skills (reading, writing, listening) needed to learn and perform the task;
- Math skills needed to learn and perform the task;
- Reasoning and problem solving skills needed to learn and perform the tasks;
- SCANS competencies essential to performing the tasks.

Instructors from Texas Instruments and Texas public community/technical colleges, of electronic engineering technician programs served as consultants/specialists in completing the task analysis. The results of the completed task analyses are presented in **Table F** for psychomotor skills and **Table G** for technical (cognitive skills).

Tables F and G show the relationship of each SCANS competency and SCANS foundation skill to each psychomotor skill and cognitive skill that must me attained for entry level.

The consultants, by expertise, were assigned the responsibility of instructional (task) analysis of the tasks in duty/function areas of the electronic engineering technician. Tables F and G reveal the results of the analyses performed by the consultants for the tasks (skill standards) identified by the Electronics Industries Foundation.

The completed task analyses (Tables F and G) have identified the instructional content that should be in the curriculum of any occupational education/training program preparing individuals for entry level skills of an electronic engineering technician.

Tables F and G present an example of completed task analysis worksheets that show the requirements (standards) and the relationships of the tasks to SCANS. The content of Tables F and G will provide the base for activities performed to enhance the technical curriculum by integrating SCANS into the instructional content of the existing technical curriculum.

During the process of identifying national skills standards in the occupational field of electronics, the **Electronics Industries Foundation** (EIF) of Washington D.C. developed a list of **"Basic Skills"** required for the electronics industry. The list of "Basic Skills" identified by the Electronics Industry Foundation is presented in **Table H**. While these were considered in the above stated process, it was agreed by consultants that these were included in the other documents and, at this time, would not be crosswalked as a seperate column.

■ SUMMARY

If occupational preparation programs are to be accountable in the **preparation of a workforce that is highly competitive in a global economy**, the content of the curricula for the programs designed under the concept of **career paths** or **career majors** must be derived from the workplace. Using the results of occupational or job analysis and the task analysis (analysis for instruction), it will become evident that the curriculum for a career path (**technical instructional goal**) will include both **academic and technical courses**. It will also become evident that to enhance the motivation of students to learn at a pace of which they are capable, the concept of the correlated curriculum must be reinstated to achieve the congressional and state mandates for the **integration of the academics and technical courses** and the inclusion of the SCANS competencies in the curriculum of each career path.

It is anticipated that similar projects or procedures used by the National Skills Standards Projects will be used to determine performance measures and standards for the identified SCANS competencies. With passage of **Goals 2000: Educate America Act** by congress and signed into law by President Clinton, this anticipation will become a reality. **Goals 2000: Educate America Act** provides for the creation of a National Skills Standards Board related to occupational education program and the creation of National Education Standards and Improvement Council related to academic education programs. This Act along with the National Skills Standards Act of 1994 will be coordinated with the School-to-Work Opportunities Act of 1994 in order to provide opportunities for the future workforce to be competitive in a global labor market.

This Handbook provides a basis for the development of new or enhancement of existing curricula and instructional content for the preparation of electronic engineering technicians. The degree to which the Handbook can be used for the purposes for which it was developed will be directly dependent on the educational preparation and experience of each user in curriculum, instructional content, and assessment development. Individuals who have not developed skills and knowledge (skill standards) needed for developing, implementing, and assessing competency-based instructional systems will be unable to effectively use the Handbook to achieve the purposes for which it was developed.

TABLES SECTION

TABLE A

ACT WORK KEYS PROFILE

ACT

Work Keys Profile

Occupation Title: Electrical Engineering Technician
Total Number of Subject Matter Experts: 8
Number of Employers Represented: 3
Number of SME Groups: 1
March 9, 1994

Reading for Information	*Applied Mathematics*	*Listening*	*Writing*	*Locating Information*	*Teamwork*	*Applied Technology*
7	>7	5	4	>6	NC	>6

Briefly, profiling involved the following four steps:

1. Developing a list of the most critical tasks to the occupation;
2. Sorting the tasks into categories associated with each *Work Keys* skill;
3. Identifying on-the-job behaviors associated with each skill as it is used in the occupation;
4. Determining the *Work Keys* skill levels of the occupation.

As the initial step, subject matter experts (SMEs), consisting of employees identified as having firsthand knowledge of the requirements of the occupation, reviewed a task list taken from the *Dictionary of Occupational Titles* for relevance and comprehensiveness. They deleted any tasks they considered unimportant, revised some task statements, and added tasks that they considered important to the occupation. The SMEs rated each task on both IMPORTANCE, the significance of the task to overall occupational performance, and RELATIVE TIME SPENT, the amount of time spent performing this task compared to other tasks. The CRITICALITY of each task to the occupation (the multiplication of IMPORTANCE and RELATIVE TIME SPENT) was then calculated. The SMEs reviewed the list of tasks and their CRITICALITY rating and revised the list so that only the most critical tasks remained.

Using this list of most critical tasks, the SMEs discussed how the *Work Keys* skills (i.e., *Applied Mathematics, Reading for Information*, etc.) were required for effective performance of each task, and then sorted the tasks into categories associated with each skill (tasks could be sorted into more than one category). Guided by these new lists, the SMEs identified on-the-job behaviors and activities that required the skill, such as reading manuals, calculating the sum of a list of numbers, etc. Finally, the SMEs reviewed the descriptions of the *Work Keys* skills to determine the levels of *Reading for Information, Applied Mathematics, Listening, Writing, Locating Information, Teamwork*, and *Applied Technology* needed to perform the tasks of the occupation.

The resulting profile determined by the SMEs is presented in the table at the top of this page. The most critical tasks and a description of the *Work Keys* skills levels for this occupation are presented on the following pages.

Profile Comments

The subject matter experts convened to produce the profile for Electrical Engineering Technician were primarily represented by one employer. The other two employers were represented by one participant each. However, these two representatives contributed their share in producing the profile.

The purpose of conducting a profile for the Electrical Engineering Technician occupation was to use the resulting information for curriculum development. For this reason, the SMEs were instructed to think of the skill levels needed for an individual entering the occupation (i.e., at the entry level). However, all the SMEs stated that an individual who has completed a program for the occupation will not be able to start out as an Electrical Engineering Technician. The person would have to start out as a Test Technician to obtain the relevant knowledge and experience to become an Electrical Engineering Technician. As a result, the profile is based on the tasks that the SMEs currently perform and on the skills and skill levels needed the SMEs were required to perform those tasks.

The discussion among the SMEs regarding appropriate skill levels resulted in a number of interesting observations which are summarized below.

Reading for Information: The group was in agreement that Level 7 is required for the occupation.

Applied Mathematics: The group agreed that at the least Level 7 is required for the occupation. They stated that Electrical Engineering Technicians regularly perform trigonometry calculations and other complex mathematical problems that require skills more complex than those at Level 7.

Listening: The group agreed that Level 5 is required for the occupation.

Writing: The group agreed that Level 4 is required for the occupation.

Locating Information: The group agreed that at the least Level 6 is required for the occupation. They stated that Electrical Engineering Technicians routinely read, interpret, draw, and modify schematics, diagrams, charts, and graphs that are more complex than those at Level 6.

Teamwork: The group did not reach consensus on the level of *Teamwork* skill required for the occupation for three reasons. First, the three employers have different structures for work teams. One of them is in the process of implementing work teams, one is well underway, and one does not have any plans for instituting work teams. Second, some of the SMEs felt very strongly against the team concept, while some felt very strongly for the team concept. Neither camp would relent from their position. Third, the discussion revealed that some work teams of Electrical Engineering Technicians operate at Level 6 skills, while some operate using skills at other levels.

Applied Technology: The group agreed that at the least Level 7 is required for the occupation. They stated that the problems at Level 7 are elementary compared to the problems they encounter on the job.

ACT.

Final Task List

1. Provides prompt and efficient service to suppliers and customers (e.g., the party who gets the product and associated test equipment) in installing, repairing, and servicing products and associated equipment.
2. Maintains the quality of services to customers, such as in installing, repairing, and servicing the products and associated equipment.
3. Follows safety procedures in testing or manufacturing products to prevent on-the-job injuries.
4. Understands how one's work contributes to the success of the work team or company.
5. Works in teams to test and troubleshoot products and associated test equipment.
6. Communicates with other departments or customers to present products and associated test equipment.
7. Interprets engineering drawings, schematic diagrams, assembly drawings, or formulas for developing products.
8. Determines malfunctions of testing equipment, such as power supplies, receivers, and indicators, using schematic and signal tracing techniques.
9. Trains technicians and/or customers to install, repair, test, and maintain products and associated test equipment.
10. Analyzes detailed operations of circuits, such as amplifiers, multivibrators, power supplies, and switching circuits.
11. Builds prototype electrical or electro-mechanical models from engineering drawings.
12. Diagnoses the cause of electrical or mechanical malfunctioning of testing equipment.
13. Suggests improvements in work methods and procedures in testing products.
14. Enters and analyzes test data using computer spreadsheets (e.g., LOTUS and EXCEL).
15. Evaluates data and writes reports to validate or indicate deviations from existing standards.
16. Installs and modifies testing equipment.
17. Prepares graphs or charts of testing data for presentation or record keeping.
18. Assembles and tests switch panels, transformers, generators, transmitters, circuit boards, and other electrical equipment and components.
19. Builds and wires new equipment to test products, such as, circuit boards, cable harnesses, and mechanical assemblies (e.g., panels, drawers, and fixtures).
20. Conducts operational and mechanical tests on prototype products.
21. Consults engineering and management personnel to set quality standards in production.
22. Modifies electrical prototypes to correct functional deviations.
23. Recommends modifications of existing quality or production standards.
24. Recommends modifications to products that do not fit acceptable specifications.
25. Compiles statistical data to determine and maintain quality and reliability of products.
26. Develops electrical machinery, circuitry, and control equipment for products.
27. Evaluates assembly requirements and configuration of products.
28. Identifies problems in software and modifies computer software to test products and associated test equipment.
29. Selects and operates the functional and operational equipment (e.g., oscilloscopes, network analyzer, and spectrum analyzer) to test products.
30. Conducts preventive and corrective maintenance on testing equipment.

Final Task List (continued)

31. Draws wiring and lays out diagrams for developing prototype products using schematic capture software.
32. Recommends revision of methods of operation or material handling, alterations in equipment layout, or other changes to increase production or improve standards.
33. Compiles an engineering change notice (ECN) for modification to the products or associated equipment by including description of change, drawings, and tables.
34. Conducts cost production studies to determine how to cut cost.
35. Designs packaging of PC board layout.
36. Performs component and device characterization (validation).
37. Plans and directs periodic evaluation of testing equipment.
38. Prepares charts, graphs, and diagrams to illustrate workflow, routing, floor layouts, material handling, and machine utilization.
39. Programs test equipment to determine the accuracy of products.
40. Designs testing programs and performs testing of integrated circuits.
41. Reads computer software and writes computer subroutines.
42. Sets up and performs destructive and nondestructive tests on products to measure performance, life, or material characteristics.

ACT

Skill Level Descriptions

Electrical Engineering Technicians Occupation

Reading for Information Level: 7
(Levels range from 3 to 7. "X" indicates skill is not applicable or is below Level 3)

Level 7

Employees must read materials which are very difficult: the information is detailed, the concepts are complicated, and the vocabulary is difficult. The jargon and technical terms used are not defined in the reading materials. Employees must generalize beyond stated situations, understand implied details, and figure out the reasoning behind stated policies and procedures.

Employees are required to

- figure out the definitions of difficult, uncommon jargon or technical terms from the context of the reading materials.
- figure out the general principles underlying described situations and apply them to situations neither described in nor completely similar to those in the reading materials.

Applied Mathematics **Level: >7**
(Levels range from 3 to 7. "X" indicates skill is not applicable or is below Level 3)

Level 7

Employees are required to

- do several steps of reasoning and calculations.
- solve problems involving more than one unknown and nonlinear functions (e.g., rate of change).
- find mistakes in multiple-step calculations.
- figure out the information needed to solve a problem when the information presented is incomplete or implicit.

For example, employees might be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, or cones; or to set up and manipulate complex ratios or proportions.

Skill Level Descriptions (continued)

Listening Level: 5
(Levels range from 0 to 5)

Level 5

Employees must understand all the information from the spoken material. In addition, they must have insight into the situation, such as information about tone or subtle details.

Writing Level: 4
(Levels range from 0 to 5)

Level 4

Employees' writing conveys information clearly. All of the sentences in the writing are complete, though they may be choppy. Writing does not contain any slang. There may be a few minor mechanical errors, but these errors do not interfere with understanding the meaning.

Locating Information **Level: >6**
(Levels range from 3 to 6, "X" indicates skill is not applicable or is below Level 3)

Level 6

Employees must read complex workplace graphics containing large amounts of information and/or challenging presentations. These graphics include very detailed graphs, charts, tables, and forms, as well as very complicated maps, blueprints, and diagrams.

Employees are required to

- make decisions, draw conclusions, and apply information to new situations using one complex graphic or several related graphics.

Skill Level Descriptions (continued)

Teamwork Level: No Consensus

(Levels range from 3 to 6. "X" indicates skill is not applicable or is below Level 3)

The group did not reach consensus as to the level of teamwork skill that is required for the occupation of Electrical Engineering Technician.

Applied Technology Level: >6

(Levels range from 3 to 6. "X" indicates skill is not applicable or is below Level 3)

Level 6

Employees are required to solve problems involving one or more tools or systems across a range of complexity. In solving some of these problems, employees must apply **difficult** physical principles, such as phase change or pressure equilibrium in a system. In solving others, employees must understand and correctly interpret the interaction of **multiple complex** systems.

Employees are required to

- understand advanced principles of mechanics, electricity, thermodynamics, and fluid dynamics.
- understand the operation of complex machines and systems, such as gasoline engines, complex appliances, and building electrical systems.

TABLE B

SCANS JOB PROFILE ELECTRICAL ENGINEERING TECHNICIANS

Table B
Comparison of ACT SCANS Job Profile for Electrical Engineering Technicians with Workplace Requirements identified by SCANS and General Education Development Levels
(Preparation Time: "7" - 2 years to 4 years)

Workplace Competencies Identified by SCANS		Workplace Foundation Skills Identified by SCANS		
	ACT Levels		Levels	
			ACT	*GED
Resources:		Basic Skills:		
Allocates Time		Reading	7	5
Allocates Money		Writing	4	5
Allocates Material and Facility Resources		Arithmetic/ Mathematics	>7	5
Allocates Human Resources		Listening	5	3
Information:		Thinking Skills:	5	
Acquires and Evaluates Information	>6	Creative Thinking		
Organizes and Maintains Information		Decision Making		
Interprets and Communicates Info.		Problem Solving		
Uses Computers to Process Info.		Seeing Things in the Mind's Eye		
Interpersonal:		Knowing How to Learn		
Participates as a Member of a Team	NC	Reasoning		
Teaches Others				
Serves Clients/Customers		Personal Qualities:	5	
Exercises Leadership		Responsibility		
Negotiates of Arrive at a Decision		Self-Esteem		
Works with Cultural Diversity		Social		
		Self-Management		
Systems:		Integrity/Honesty		
Understands Systems				
Monitors and Corrects Performance				
Improves and Designs Systems				
Technology:				
Selects Technology				
Applies Technology	>6			
Maintains and Troubleshoots Technology				

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* Department of Labor Levels, **WORKSHOP PARTICIPANTS HANDOUTS for Integrating Actdemic Skills with Technical/Vocational Instruction,** Northeast Texas Community College.

TABLE C

ELECTRONIC INDUSTRY FOUNDATION
DRAFT SKILL STANDARDS
PSYCHOMOTOR

TABLE C
Electronic Industry Foundation
Draft Skill Standards
Entry Level Electronics Technician
Psychomotor

A. General

B. DC Circuits

B.11 Fabricate and demonstrate DC series circuits
B.12 Troubleshoot and repair DC series circuits
B.14 Fabricate and demonstrate DC parallel circuits
B.15 Troubleshoot and repair DC parallel circuits
B.17 Fabricate and demonstrate DC series-parallel and bridge circuits
B.18 Troubleshoot and repair DC series-parallel and bridge circuits
B.20 Fabricate and demonstrate DC voltage divider circuits (Loaded and Unloaded)
B.21 Troubleshoot and repair DC voltage divider circuits (Loaded and Unloaded)
B.23 Fabricate and demonstrate DC RC and RL circuits
B.24 Troubleshoot and repair DC RC and RL circuits

C. AC Circuits
C.08 Fabricate and demonstrate AC capacitive circuits
C.09 Troubleshoot and repair AC capacitive circuits
C.11 Fabricate and demonstrate AC inductive circuits
C.12 Troubleshoot and repair AC inductive circuits
C.14 Fabricate and demonstrate AC circuits using transformers
C.15 Troubleshoot and repair AC circuits using transformers
C.17 Fabricate and demonstrate AC differentiator and integrator circuits
C.18 Troubleshoot and repair AC differentiator and integrator circuits
C.20 Fabricate and demonstrate AC series and parallel resonant circuits
C.21 Troubleshoot and repair AC series and parallel resonant circuits
C.23 Fabricate and demonstrate AC RC, RL, and RLC circuits
C.24 Troubleshoot and repair AC RC, RL, and RLC circuits
C.26 Fabricate and demonstrate AC frequency selective filter circuits
C.27 Troubleshoot and repair AC frequency selective filter circuits
C.29 Fabricate and demonstrate AC polyphase circuits
C.30 Troubleshoot and repair AC polyphase circuits
C.32 Fabricate and demonstrate AC phase locked loop circuits
C.33 Troubleshoot and repair AC phase locked loop circuits

D. Discrete Solid State Devices

D.07 Fabricate and demonstrate diode circuits
D.08 Troubleshoot and repair diode circuits
D.10 Fabricate and demonstrate optoelectronic circuits (gate isolators, interrupt sensors, infra red sensors, etc.)

D.11 Troubleshoot and repair optoelectronic circuits (Gate isolators, interrupt sensors, infra red sensors)
D.13 Fabricate and demonstrate single stage amplifiers
D.14 Troubleshoot and repair single stage amplifiers
D.16 Fabricate and demonstrate thyristor circuitry (SCR, TRIAC, DIAC, etc.)
D.17 Troubleshoot and repair thyristor circuitry (SCR, TRIAC, DIAC, etc.)

E. Analog Circuits

E.02 Fabricate and demonstrate multistage amplifiers
E.03 Troubleshoot and repair multistage amplifiers
E.05 Fabricate and demonstrate RF/IF circuits
E.06 Troubleshoot and repair RF/IF circuits
E.08 Fabricate and demonstrate linear power supplies and filters
E.09 Troubleshoot and repair linear power supplies and filters
E.11 Fabricate and demonstrate operational amplifier circuits
E.12 Troubleshoot and repair operational amplifier circuits
E.14 Fabricate and demonstrate audio power amplifiers
E.15 Troubleshoot and repair audio power amplifiers
E.17 Fabricate and demonstrate regulated and switching power supply circuits
E.18 Troubleshoot and repair regulated and switching power supply circuits
E.20 Fabricate and demonstrate active filter circuits
E.21 Troubleshoot and repair active filter circuits
E.23 Fabricate and demonstrate sinusoidal and non-sinusoidal oscillator circuits
E.24 Troubleshoot and repair sinusoidal and non-sinusoidal oscillator circuits
E.26 Fabricate and demonstrate fiber optic circuits using photodiodes or Lasers
E.27 Troubleshoot and repair fiber optic circuits using photodiodes or LASERS
E.29 Fabricate and demonstrate signal modulation systems (AM, FM, stereo)
E.30 Troubleshoot and repair signal modulation systems (AM, FM, stereo)

F. Digital Circuits

F.04 Fabricate and demonstrate linear integrated circuits
F.05 Troubleshoot and repair linear integrated circuits
F.07 Fabricate and demonstrate types of logic gates
F.08 Troubleshoot and repair types of logic gates
F.10 Fabricate and demonstrate combinational logic circuits
F.11 Troubleshoot and repair combinational logic circuits
F.13 Fabricate and demonstrate types of flip-flop circuits
F.14 Troubleshoot and repair flip-flop circuits
F.16 Fabricate and demonstrate types of registers and counters
F.17 Troubleshoot and repair types of registers and counters
F.19 Fabricate and demonstrate clock and timing circuits
F.20 Troubleshoot and repair clock and timing circuits
F.22 Fabricate and demonstrate types of arithmetic-logic circuits
F.23 Troubleshoot and repair types of arithmetic-logic circuits
F.25 Fabricate and demonstrate types of multiplexer and demultiplexer circuits

F.26 Troubleshoot and repair types of multiplexer and demultiplexer circuits
F.28 Fabricate and demonstrate types of digital to analog and analog to digital circuits
F.29 Troubleshoot and repair types of digital to analog and analog to digital circuits
F.31 Fabricate and demonstrate types of digital display circuits
F.32 Troubleshoot and repair types of digital display circuits
F.34 Fabricate and demonstrate digital power distribution and noise problems
F.35 Troubleshoot and repair digital power distribution and noise problems
F.37 Fabricate and demonstrate types of digital encoders and decoders
F.38 Troubleshoot and repair types of digital encoders and decoders
F.40 Fabricate and demonstrate digital display devices
F.41 Troubleshoot and repair digital display devices

G. Microprocessors

G.09 Fabricate and demonstrate types of microprocessor memory circuits
G.10 Troubleshoot and repair types of microprocessor memory circuits
G.12 Fabricate and demonstrate microprocessor machine code and instruction sets
G.13 Troubleshoot and repair microprocessor machine code and instruction sets

TABLE D

ELECTRONICS INDUSTRY FOUNDATIONS SKILL STANDARDS COGNITIVE

Table D
Electronic Industry Foundation
Draft Skills Standards
Entry Level Electronics Technician
Cognitive (Knowledge)

A. General

A.01 Demonstrate an understanding of proper safety techniques for all types of circuits and components (D.C. circuits, A.C. circuits, Audio systems, Analog circuits, Digital, Circuits, discrete solid-state circuits, microprocessors) and apply proper OSHA safety standards
A.02 Demonstrate an understanding of proper troubleshooting techniques
A.03 Demonstrate an understanding of basic assembly skills using hand and power tools
A.04 Demonstrate an understanding of acceptable soldering/desoldering techniques, including through-hole and surface mount devices
A.05 Demonstrate an understanding of proper solderless connections
A.06 Demonstrate an understanding of use of data books and cross reference/technical manuals to specify and requisition electronic components
A.07 Demonstrate an understanding of the interpretation and creation of electronic schematics and technical drawings
A.08 Demonstrate an understanding of recording of data, design curves and graphs
A.09 Demonstrate an understanding of color codes and other component descriptors
A.10 Demonstrate and understanding of site electrical and environmental survey

B. DC Circuits

B.01 Demonstrate and understanding of the relationship of electricity to the nature of matter
B.02 Demonstrate an understanding of sources of electricity (DC & AC)
B.03 Demonstrate an understanding of principles and operation of electrochemical supplies
B.04 Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, power and energy in D.C.
B.05 Demonstrate an understanding of measurement of resistance of conductors and insulators and the computation of conductance
B.06 Demonstrate an understanding of application of Ohms Law to series, parallel and series-parallel circuits

B.07 Demonstrate an understanding of magnetic properties of circuits and devices
B.08 Demonstrate an understanding of the physical, electrical characteristics of capacitors and inductors
B.09 Demonstrate an understanding of the maximum power transfer theory
B.10 Understand principles and operations of DC series circuits
B.13 Understand principles and operations of DC parallel circuits

B.16 Understand the principles and operations of DC series-parallel and bridge circuits
B.19 Understand the principles and operations of DC voltage divider circuits (Loaded and Unloaded)
B.22 Understand principles and operations of DC RC and RL circuits

C. AC Circuits

C.01 Demonstrate an understanding of the properties of an AC signal
C.02 Demonstrate an understanding of the principles of operation and characteristics of sinusoidal and non-sinusoidal wave forms
C.03 Demonstrate an understanding of basic motor/generator theory and operation
C.04 Demonstrate an understanding of measurement of power in AC and DC circuits
C.05 Demonstrate an understanding of the principle and operation of various power conditioning: (isolation transformers, surge suppressors, uninterruptable power systems)
C.06 Demonstrate an understanding of the principle and operation of safety grounding systems: (lightening arresters, ground fault interrupters, etc.)
C.07 Understand principles and operations of AC capacitive circuits
C.10 Understand principles and operations of AC inductive circuits
C.13 Understand principles and operations of AC circuits using transformers
C.16 Understand principles and operations of AC differentiator and integrator circuits (determine RC and RL time constants)
C.19 Understand principles and operations of AC series and parallel resonant circuits
C.22 Understand principles and operations of AC RC, RL, and RLC circuits
C.25 Understand principles and operations of AC frequency selective filter circuits
C.28 Understand principles and operations of AC polyphase circuits
C.31 Understand principles and operations of AC phase locked loop circuits

D. Discrete Solid State Devices

D.01 Demonstrate an understanding of the properties of semiconductor materials
D.02 Demonstrate an understanding of PN junctions
D.03 Demonstrate an understanding of bipolar transistors
D.04 Demonstrate an understanding of field effect transistors (FET's/MOS-FET's)
D.05 Demonstrate an understanding of special diodes and transistors
D.06 Understand principles and operations of diode circuits
D.09 Understand principles and operations of optoelectronic circuits (Gate isolators, Interrupt sensors, infra red sensors, etc.)
D.12 Understand principles and operations of single stage amplifiers
D.15 Understand principles and operations of thyristor circuitry (SCR, TRIAC, DIAC, etc.)

E. Analog Circuits

E.01 Understand principles and operations of multistage amplifiers
E.04 Understand principles and operations of RF/IF circuits
E.07 Understand principles and operations of linear power supplies and filters
E.10 Understand principles and operations of operational amplifier circuits
E.13 Understand principles and operations of audio power amplifiers
E.16 Understand principles and operations of regulated and switching power supply circuits
E.19 Understand principles and operations of active filter circuits
E.22 Understand principles and operations of sinusoidal and non-sinusoidal oscillator circuits
E.25 Understand principles and operations of fiber optic circuits using photodiodes or LASERS
E.28 Understand principles and operations of signal modulation systems
E.31 Demonstrate an understanding of motor phase shift control circuits
E.32 Demonstrate an understanding of cathode ray tubes

F. Digital Circuits

F.01 Demonstrate an understanding of the characteristics of integrated circuit (IC) logic families
F.02 Demonstrate an understanding of minimizing logic circuits using Boolean operations
F.03 Understand principles and operations of linear integrated circuits
F.06 Understand principles and operations of types of logic gates
F.09 Understand principles and operations of combinational logic circuits
F.12 Understand principles and operations of types of flip-flop circuits
F.15 Understand principles and operations of types of registers and counters
F.18 Understand principles and operations of clock and timing circuits
F.21 Understand principles and operations of types of arithmetic-logic circuits
F.24 Understand principles and operations of multiplexer and demultiplexer circuits
F.27 Understand principles and operations of digital to analog and analog to digital circuits
F.30 Understand principles and operations of types of digital display circuits
F.33 Understand principles and operations of digital power distribution and noise problems
F.36 Understand principles and operations of digital encoders and decoders
F.39 Understand principles and operations of digital display devices

G. Microprocessors

G.01 Demonstrate an understanding of microprocessor peripherals and their interfaces
G.02 Demonstrate an understanding of troubleshooting and repair of microprocessor peripheral interfaces

G.03 Demonstrate an understanding of types of microprocessor peripherals
G.04 Demonstrate an understanding of the properties of essential microprocessor components
G.05 Demonstrate an understanding of the use of a microcomputer operating system
G.06 Demonstrate an understanding of microprocessor BUS concepts
G.07 Demonstrate an understanding of microprocessor components and terminology (CPU, AU, Device Driver, ROM, RAM, EPROM, etc.)
G.08 Understand principles and operations of types of microprocessor memory circuits
G.11 Understand principles and operations of microprocessor machine code and instruction sets

TABLE E

CROSSWALK SCANS PROFILES

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TABLE E
SCANS Arithmetic/Math Crosswalk

I. Foundations (F) from **SCANS, Skills and Tasks for Jobs,** U.S. Department of Labor:

F3 Arithmetic

- a) performs basic computations
- b) uses basic numerical concepts such as whole numbers and percentages in practical situations
- c) makes reasonable estimates of arithmetic results without a calculator
- d) uses tables, graphs, diagrams, and charts to obtain or convey quantitative information.

F4 Mathematics

- a) approaches practical problems by choosing appropriately from a variety of mathematical techniques
- b) uses quantitative data to construct logical explanations for real world situations
- c) expresses mathematical ideas and concepts orally and in writing
- d) understands the roll of chance in the prediction and control of events.

II. General Education Development from Northeast Texas Community College document **WORKSHOP PARTICIPANTS HANDOUTS for Integrating Academic Skills with Technical/Vocational Instruction:**

Level 2: Grade 4-6
Level 3: Grade 7-8
Level 4: Grade 9-12
Level 5: College 1-2

III. ACT Work Keys:

Level 3: Problems at this level measure the examinee's skill in performing basic mathematical operations (addition, subtraction, multiplication, and division) and conversions from one form to another, using whole numbers, fractions, decimals, or percentages. Solutions to problems at this level are straightforward, involving a single type of mathematical operation. Problems at this level translate easily from a verbal setup to a mathematical equation. All the information needed to solve the problems is provided in logical order and no unrelated information is included. Problem setups may include units of measurement. However, with the exception of dollars and cents, these units function solely as labels and are not involved in actual calculation.

Level 4: Problems at this level measure the examinee's skill in performing one or two mathematical operations, such as addition, subtraction, or multiplication, on several positive or negative numbers. (Division of negative numbers is not covered until Level 5.) Problems may require adding commonly known fractions, decimals, or percentages (e.g., ½, .75, 25%), or adding three fractions that share a common denominator. At this level, the examinee is also required to calculate averages, simple ratios, proportions, and rates, using whole numbers and decimals. Problems at this level require the examinee to reorder verbal information before performing calculations. The examinee must read the entire problem carefully to determine which operation(s) to perform and in what order. In some problems, examinees must read a simple chart or graph to obtain the information needed to solve the problem.

Level 5: This requires the examinee to look up and calculate single-step conversions within English or non-English systems of measurement (e.g., converting from ounces to pounds or from centimeters to meters) or between systems of measurement (e.g., converting from centimeters to inches). These problems also require calculations using mixed units (e.g., hours and minutes). Problems at this level contain several steps of logic and calculation. The examinee must determine what information, calculations, and unit conversions are needed to find a solution.

Level 6: Problems at this level measure the examinee's skill in calculating using negative numbers, fractions, ratios, percentages, and mixed numbers. The examinee might be required to calculate multiple rates to find areas of rectangles or circles and volumes of rectangular solids or to solve problems that compare production rates and pricing schemes. The examinee might need to transpose a formula before calculating or to look up and use two formulae in conversions within a system of measurement. These problems may also involve identifying and correcting errors in calculations. These problems may require considerable translation from verbal form to mathematical expression. These generally require considerable set up and involve multiple-step calculations or conversions.

Level 7: Problems at this level require multiple steps of logic and calculation. The examinee may be required to convert between systems of measurement that involve fractions, mixed numbers, decimals, or percentages; to calculate multiple areas and volumes of spheres, cylinders, and cones; to set up and manipulate complex ratios and proportions; or to determine the better economic value of several alternatives. Problems may involve more than one unknown, nonlinear functions (e.g., rate of change), and applications of basic statistical concepts (e.g., error of measurement). The examinee may be required to locate errors in multiple-step calculations. Problem content or format may be unusual, and the information presented may be incomplete or implicit, requiring the examinee to derive from the setup the information needed to solve the problem.

Math Crosswalk of Skills Descriptions

ACT	SCANS	Coordinating Board Research (CBR)	Department of Labor General Educational Development (G.E.D.)	Improvement for Undergraduate Education in Texas: College Level Competencies Fund for the Improvement of Postsecondary Education (F.I.P.S.E.)	Texas Academic Skills Program (T.A.S.P.)
<3	F3-B	Write whole numbers from written text (six thousand three = 6003).	*Level 2 Read and write 7 digit numbers. Learn ordinals through "thousands". Count fractions and decimal fractions. Place values of numbers to left and right of decimal point. Add multi-digit columns. Subtract multi-digit columns. Multiply two or three digit multipliers. Two or three digit divisors. Add, subtract, multiply, and divide common and decimal fractions, mixed numbers, improper fractions. Introduction to ratio and rate, percent. Change fractions to decimal fractions and to percent.	Use mathematics comfortably and spontaneously in many different settings, in a variety of courses. Determine when a problem requires a fixed answer and when estimation is appropriate.	1. Use number concepts and computation skills. This skill includes adding, subtracting, multiplying, and dividing fractions, decimals, and integers; using the order of operations to solve problems; solving problems involving percents; performing calculations using exponents and scientific notation; estimating solutions to problems; and using the concepts of "less than" and "greater than".
3	F3-a,b	Add and subtract single and multiple digit whole numbers.			
<3	F3-b	Read and count single and multiple digit whole numbers.			
<3	F3-b	Round off single and multiple digit whole numbers.			
<3	F3-b	Read and write common fractions.			
3	F3-a	Multiply and divide common fractions.			
3	F3-a	Reduce fractions to lowest terms.			
3	F3-a	Find common denominator.			
4	F3-a	Change fractions from one denominator to another.			
3	F3-b	Translate a mixed number into an improper fraction and reverse.			

ACT	SCANS	C.B.R.	(G.E.D.)	(F.I.P.S.E.)	(T.A.S.P.)
3	F3-a	Carry out arithmetic computations involving dollars and cents.	*Level 3 Mastery of four basic arithmetic operations. Emphasis on speed and accuracy in computation. Extension to 4- and 5-digit multipliers and divisors. Learn use of symbols for numbers, terms such as exponent and power. Learn to find square roots.		
<3	F3-b	Read and write decimals with one or more places.			
<3	F3-b	Round off decimals to one or more places.			
4	F3-a	Multiply and divide decimals with one or more places.			
3	F3-a	Add and subtract decimals with one or more places.			
3	F3-a	Convert fraction to decimal equivalent and vice versa.			
3	F3-a,b	Convert decimal number to percent and vice versa.			
<3	F3-b	Read and write percents.			
3	F3-a,b	Compute percents.			
3	F3-a	Convert mixed numbers to decimals and decimal fractions to mixed numbers.			
4	F3-a	Compute averages.			
5	F3-a	Perform conversions within metric system (weight, distance, volume).			
<3	F3-a,F4-a	Use a calculator to perform basic arithmetic operations.			
6	F4-a, c	Use formulas appropriately.			
3	F3-c	Estimate distances in inches, feet, yards, and miles.			
>7	F4-c,a	Convert base ten numbers to other base number systems.			

ACT	SCANS	C.B.R.	G.E.D.	(F.I.P.S.E.)	T.A.S.P.
7	F4 a	Factor.			
4	F4 c	Recognize and name types of angles.			
4	F3 d	Recognize and name geometric figures.			
6	F3 a, F4 a	Solve problems to find length of sides of angles of geometric figures.	*Level 2 Introduction to reasoning and analysis of problems such as finding a part of a number. Finding the whole when a part is given. Learn relationships of standard units of measurement to each other. Convert units of measure to smaller or larger units, such as inches to feet, acres to square miles, hours to days, minutes to seconds, or ounces to pounds.	Examine a problem situation from different perspectives and use corresponding mathematical structures. Evaluate the appropriateness of different methods of problem solution. Be selective in the use of a variety of solution strategies. Employ a variety of strategies in searching for a solution to a problem.	2. Solve word problems involving integers, fractions, or decimals (including percents, ratios, and proportions). This skill includes determining the appropriate operations to solve word problems involving integers, fractions, decimals, percents, ratios, and proportions.
3	F3 a, F4 c	Use arithmetic operations to solve word problems with whole numbers.			
3	F4 a, c	Perform arithmetic operations using correct hierarchy.			
3	F3 a, F4 a	Solve word problems with common fractions.			
3	F3 a, F4 a	Solve word problems with decimals in one or more places.			
<3	F3 b, F4 c	Write digit equivalents of orally stated decimal number.			
3	F3 a, F4 c	Solve word problems.			
6	F3 a, b	Solve problems involving ratio and proportions.	*Level 3 Mastery of the four basic arithmetic operations in common, decimal and improper fractions and mixed numbers. Apply knowledge to solve "story problems".		
5	F3 a	Solve problems involving time, weight, distance, and volume.			
7	F3 c, F4 a	Determine if a solution to a mathematical problem is reasonable.			

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
6	F3 a,b	Solve basic ratio problems.	Develop speed and accuracy in changing fractions into percent and percent into fractions.		
6	F3 a	Reduce ratios to lowest terms.			
6	F3 a,b, F4 a	Utilize ratio and proportion to solve word problems.	Memorize most common equivalents, such as halves, quarters, eighths, fifths, thirds, sixths, and twelfths, and mentally convert time to decimal fractions and percents.		
7	F3 a, d	Find sine, cosine, and tangent of an angle using a table and calculator.			
			Memorize and apply formulas to solve "story problems:, as: $P=RB$ $R=\frac{P}{B}$ $B=\frac{P}{R}$		
			Perform the four basic arithmetic functions to solve problems involving different units of same type of measurement, as: Time: 4wks. 6 days 32 hrs. +2wks. 3 days 25 hrs.		
			Apply knowledge of percentage to compute interest, discount, etc.		
			Learn to use ratio and proportion to solve problems.		
7		No close match found.	*Level 4		
			Review and extension of principles of common and decimal fractions, percentages, ratio, and proportion.		
			Practical computation.		
			Practical algebra.		

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
			Metric geometry. Formulas for computing ratios of pulleys and gears. Practical physics: Formulas for work and power, etc. *Level 5 Interest and discount.		
7	F3 d, F4 a	No close match found.	*Level 3 Learn to construct and interpret line, bar, and picture graphs.	Communicate, either orally or in writing, mathematical understanding of the analysis and the solution of a problem, using proper mathematical terminology and syntax.	3. Interpret information from a graph, table or chart. This skill includes interpreting information in line graphs, bar graphs, pie graphs, pictographs, tables, charts, or graphs of functions.
7			Convert degrees to percents to draw circle graphs.		
4			*Level 5 In statistics, graphic presentations illustrating average, dispersions, quartiles and percentiles, frequency distribution, reliability, and validity of tests.	Make and defend decisions by organizing and presenting data, by using logical arguments and by using probability.	
7	F4 a, F3 c	Use direct and inverse variations to solve word problems.	No close match found.	Generalize over many similar mathematical situations.	B. Algebra 1. Graph numbers or number relationships. This skill includes identifying points from their coordinates, the coordinates of points, or graphs of sets of ordered pairs; identifying the graphs of equations or inequalities, finding the slopes and intercepts of lines; and recognizing direct and inverse variation presented graphically.
7	F3 d, F4 a	Construct graphs on coordinate plane.			

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
7	F3-a	Solve linear equations in one variable.	*Level 5 Linear equation.	No close match found	2. Solve one and two variable equations. This skill includes finding the value of the unknown in one variable equations, expressing one variable in terms of a second variable in two variable equations, and solving a system of two linear equations in two variables.
7	F3-a	Solve linear inequalities (extended).			
7	F3-a, F4-a	Solve systems of inequality (extended).			
4	F3-a, F4-a	Solve proportion problems with one unknown.			
7	F3-a	Solve systems of linear equations.			
		No close match found	No close match found	Discover inconsistencies in problems. Read, write and understand the language of mathematics.	3. Solve word problems involving one and two variables. This skill includes solving word problems that can be translated into one variable linear equations and identifying the equation or equations that correctly represent the mathematical relationship(s) in word problems.
7	F3-a, F4-a	Add, subtract, multiply, and divide algebraic expressions.	*Level 4 Formal study of number systems. Operations on polynomials and rational expressions; solution of equations and inequalities; use of deduction and proof..	No close match found	4. Understand operations with algebraic expressions. This skill includes factoring quadratics and polynomials; adding, subtracting, and multiplying polynomial expressions; and performing basic operations on and simplifying rational expressions.
7	F3-a, F4-a	Add, subtract, multiply, and divide algebraic fractions.			
7	F3-a, F4-a	Use exponents and square roots appropriately.			

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
			Study of the systems of real numbers; linear, quadratic, rational, exponential, logarithmic, angle, and circular functions; inverse functions; related algebraic functions.		
7	F3-a, F4-a	Solve quadratic equations by factoring.	*Level 5 Exponents.	No close match found	5. Solve problems involving quadratic equations.
7	F3-d, F4-a	Construct graphs on coordinate plane.	*Level 5 Quadratic equations		This skill includes graphing quadratic equations, solving word problems involving quadratics, identifying the algebraic equivalent of stated relationships, and solving quadratic equations.
7	F3-a, F4-a	Find sine, cosine, and tangent of an angle using a table and calculator.	*Level 5 General introduction to the concepts of algebra, plane geometry.		C. Geometry 1. Solve problems involving geometric figures.
6	F3-a	Solve problems to find length of sides and angles of geometric figures.			This skill includes identifying the appropriate formula for solving geometric problems, solving problems involving two- and three-dimensional geometric figures, and solving problems involving right triangles using Pythagorean theorem.
4	F3-d	Recognize and name types of angles.	*Level 2 Learning geometric meanings of terms such as radius, diameter, perimeter, circumference, area of rectangle and volume.	Reasoning clearly and present logical arguments using both inductive and deductive methods.	
7	F3-b, F4-c	Recognize and name geometric figures.			2. Apply reasoning skills.
7	F4-a, F3-d	Prepare a truth table.	Construct graphs, charts, and tables.		This skill includes drawing conclusions using the principles of similarity, congruence, parallelism, and perpendicularity and using inductive and deductive reasoning.
7	F4-a, F3-d	Obtain unions and intersections of given sets.	Construct simple geographic forms such as arcs, triangles and perpendiculars.		

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
			*Level 3 Recognize and understand geometric meanings of terms as horizontal, vertical, perpendicular, oblique and obtuse. Learn number of degrees in a circle, relationship between angles and degrees, types of triangles: equilateral, isosceles, right and obtuse. Types of parallelograms: oblong, square, rhomboid, and rhombus. Learn formulas for finding area of geometric figures. *Level 5 Development of propositional and predicate calculi, basic semantic concepts and elementary intuitive set theory.		

SCANS Reading Report

I. Foundations (F) from **SCANS, Skills and Tasks for Jobs,** U. S. Department of Labor

F1 a) Locates, understands, and interprets written information documents including manuals, graphs, and schedules to perform basic trends;
b) Learns from text by determining the main idea or essential message;
c) Identifies relevant details, facts, and specifications;
d) Infers or locates the meaning of unknown or technical vocabulary;
e) Judges the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers.

II. General Education Development from Northeast Texas Community College document **WORKSHOP PARTICIPANTS HANDOUTS for Integrating Academic Skills with Technical/Vocational Instruction:**

Level 2: Grade 4-6
Level 3: Grade 7-8
Level 4: Grade 9-12
Level 5: College 1-2

III. ACT Work Keys:

Level 3: This level requires the examinee to identify uncomplicated key concepts and simple details; recognize the proper placement of a step in a sequence of events, or the proper time to perform a task.

Level 4: This level requires the skills tested at Level 3 plus identify details that are more subtle than those in Level 3; recognize the application of more complex instructions, some of which involve several steps, to describe situations; recognize cause-effect relationships.

Level 5: This requires the examinee to have the skills included in Levels 3 and 4 plus to identify the paraphrased definition of jargon or technical terms that are defined in the passage and recognize the application of jargon or technical terms to stated situations; recognize the definitions of acronyms that are defined in the passage; identify the appropriate definition of words with multiple meanings; recognize the application of instructions from the passage to new situations that are similar to the situations described in the reading materials; and recognize the application of more complex instructions to described situations, including conditionals and procedures with multiple steps.

Level 6: This level requires the examinee to have the skills included in Levels 3, 4, and 5 plus to recognize the application of jargon or technical terms to new situations; recognize the application of complex instructions to new situations; recognize the less common meaning of a word with multiple meanings from context; identify implied details; explain the rational behind a procedure, policy or communication; and generalize from the passage to a somewhat similar situation.

Level 7: This level requires the examinee have the skills in levels 3, 4, 5, and 6 plus to recognize the definitions of difficult, uncommon jargon or technical terms from context and generalize from the passage to situations neither described in nor completely similar to those in the passage.

READING CROSSWALK OF IDENTIFIED SKILL DESCRIPTIONS

ACT	SCANS	Coordinating Board Research	Department of Labor General Educational Development (G.E.D.)	Improvement for Undergraduate Education in Texas: College Level Competencies Fund for the Improvement of Postsecondary Education (F.I.P.S.E.)	Texas Academic Skills Program (T.A.S.P.)
3	F1-a	Find, read and understand information written on a grade level of 8, 10, 12, 14, and above	*Level 2 In reading learn roots, prefixes, and suffices. Learn to read discriminately, distinguishing between essential and non-essential material. Enrich vocabulary with wide selection of reading material. Introduction to magazines, newspaper, bulletins, etc.	No close match found.	1. Determine the meaning of words and phrases. This skill includes using the context of a passage to determine the meaning or words with multiple meaning, unfamiliar and uncommon words and phrases, and figurative expressions.
5	F1-a	Read information written on a level of difficulty above grade 14.			
3	F1-c	Read and interpret job related forms.			
3	F1-b	Read and understand short notes, memos, and letters.			
	F1-d	Use context and signal words to determine definitions of new words.			

READING CROSSWALK OF IDENTIFIED SKILL DESCRIPTIONS

ACT	SCANS	Coordinating Board Research	Department of Labor General Educational Development (G.E.D.)	Improvement for Undergraduate Education in Texas: College Level Competencies Fund for the Improvement of Postsecondary Education (F.I.P.S.E.)	Texas Academic Skills Program (T.A.S.P.)
3	F1-a	Find, read and understand information written on a grade level of 8, 10, 12, 14, and above	*Level 2 In reading learn roots, prefixes, and suffices. Learn to read discriminately, distinguishing between essential and non-essential material. Enrich vocabulary with wide selection of reading material. Introduction to magazines, newspaper, bulletins, etc.	No close match found.	1. Determine the meaning of words and phrases. This skill includes using the context of a passage to determine the meaning or words with multiple meaning, unfamiliar and uncommon words and phrases, and figurative expressions.
5	F1-a	Read information written on a level of difficulty above grade 14.			
3	F1-c	Read and interpret job-related forms.			
3	F1-b	Read and understand short notes, memos, and letters.			
	F1-d	Use context and signal words to determine definitions of new words.			

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
4	F1-b	Paraphrase a passage to confirm one's understanding of what was read.	*Level 3 Read to find main thought or idea of a paragraph. Locate topic and summary sentence, and identify details and relate them to central thought.	Comprehend key terms and discriminate between main and subordinate ideas either explicitly stated or impled by the text.	2. Understand the main idea and supporting details in written material. This skill includes identifying explicit and implicit main ideas and recognizing ideas and recognizing ideas that support, illustrate, or elaborate the main ideas of a passage.
5	F1-b	Distinguish between the major premise and supporting facts.			
4	F1-b	Explain the main idea in written or oral communication.		Recognize how subordinate ideas contribute to the development of a major lead in the overall discussion.	
4	F1-e	No close match found.	*Level 5 Reading literature, book and play reviews, scientific and technical journals, abstract, financial reports, legal, historical and medical documents, periodicals.	Understand the author's use of literary device such as simile, metaphor, allusion, imagery, and point of view. Recognize the author's assumptions and biases while withholding final judgment. Recognize the text's audience, purpose, and occasion.	3. Identify a writer's purpose, point of view, and intended meaning. This skill includes recognizing a writer's expressed or implied purpose for writing; evaluating the appropriateness of written material for various purposes or audiences; recognizing the likely effect on an audience of a writer's choice of words; and using the content, work choice, and phrasing of a passage to determine a writer's opinion or point of view.

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
5	F1 e	Evaluate the relevance and strength of support for a conclusion.	*Level 5 Study of the principles of inductive and deductive reasoning such as testing evidence, validity of generalization, and cause and effect relationships to detect fallacies in arguments and to avoid these errors in own writing. (also in writing IIA, 1., b.)	Organize thoughts to guide comprehension by step by step or spatial sequences, cause-effect relationships, comparisons or contrasts, and problem solution methods. Recognize either conventional patterns or organization or educe and impose organization on the text when the author does not make the organization clear. Arrive at appropriate conclusions and select supportive evidence from the text. Identify logical relation ships as well as fallacies in logic.	4. Analyze the relation ship among ideas in written material. This skill includes identifying the sequence of events or steps, identifying cause effect relationships, analyzing relationships between ideas in opposition, identifying solutions to problems, and drawing conclusions inductively and deductively from information stated or implied in a passage.
5	F1-e	Recognize patterns of organization of information cause, effect, etc.			
5	F1-e	Identify the conclusions in written and oral communication.			
5	F1 e	Distinguish between fact and opinion.	No close match found.	Re-read to check, monitor and evaluate accuracy of original judgments about the text. Determine whether the author of a narrative has succeeded in communicating point of view; in setting an identifiable tone for the selection; in developing a worthwhile	5. Use critical reasoning skills to evaluate written material. This skill includes evaluating the stated or implied assumptions on which the validity of a writer's argument depends; judging the relevance or importance of facts, examples, or graphic data to a writer's argument evaluating the validity of analogies, distinguishing between
5	F1-e	Judge the credibility of a source of information.			

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
				plot, characterizations and setting.	fact and opinion; and assessing the credibility or objectivity of the writer or source of written material.
				Determine whether a conclusion or interpretation drawn from the text is reasonable, relevant, and adequately supported by evidence from the text.	
				Determine whether conclusions drawn would appear justified to an informed audience.	
3	F1-a	Use the telephone directory to make local and long distance calls.	*Level 2 Study of the dictionary to learn syllabication accent and diacritical marks such as macron (-), breve (v), double dot and single dot as an aid to pronunciation. Study of road maps, time tables, and entertainment guides to determine distances between cities, report on transportation schedules and discuss merits of available entertainment. Obtain library card and locate books, using index file.	Understand concepts and generalizations including those presented in visual materials such as maps, charts, graphs, and tables.	6. Apply study skills to reading assignment. This skill includes organizing and summarizing information for study purposes; following written instructions or directions; and interpreting information presented in charts, graphs, or tables.
3	F1-a	Use textbook features, such as index, table of contents, glossaries, etc.		Understand the use of mathematical notation and definitions, translation of work problems into mathe-matical formulations and interpretation of graphs of functions.	
	F1-B	Recall information accurately from memory.			
3	F1-c	Carry out correctly written or oral instructions.			
3	F1-a	Use a thesaurus.		Selectively note of display relationships of ideas (such as an outline or map) which will serve the purposes set for reading.	

ACT	SCANS	C.B.R.	G.E.D.	F.I.P.S.E.	T.A.S.P.
3	F1-a	Read and understand graphs, maps, charts, and ta	*Level 3 In reference works, utilize dictionary to learn alphabetical order, guide works, diacritical marks, synonyms and antonyms. Use encyclopedia , atlases, magazines, and source books to prepare class assignments.	Summarize key ideas accurately. Draw deductions from information displayed in maps, graphs, and tables.	(6. CONT.)
3	F1-a		*Level 4 Use of reference works such as dictionary, encyclopedia, atlas, thesaurus, manuals, periodicals, newspapers, journals, books, and play reviews. Reading a variety of textbooks; fiction and non-fiction; newspapers; magazines.		

SCANS Writing Report

I. Foundations (F) from **SCANS, Skills and Tasks for Jobs,** U. S. Department of Labor:

F2 a) Communicates thoughts, ideas, information, and messages in writing

b) Records information completely and accurately

c) Composes and creates documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts.

d) Uses language, style, organization appropriate to the subject matter, purpose, and audience.

e) Includes supporting documentation and attends to level of detail

f) Checks, edits, and revises for current information, appropriate emphasis, form, grammar, spelling, and punctuation.

II. General Educational Development (GED) from Northeast Texas Community College document **WORKSHOPS PARTICIPANTS HANDOUTS for Integrating Acdamic Skills with Technical/Vocational Instruction**:

Level 2: Grade 4-6
Level 3: Grade 7-8
Level 4: Grade 9-12
Level 5: College 1-2

III. ACT Work Keys:

Level 1: Message conveyed inadequately: Overall lack of proper sentence structure.

Level 2: Message conveyed adequately; weak sentence structure; large number of mechanical errors.

Level 3: Message conveyed clearly; most sentences complete; some mechanical errors.

Level 4: Message conveyed clearly; all sentences are complete; may have a few minor mechanical errors; may have a choppy style.

Level 5: Message conveyed clearly; good sentence structure; no mechanical errors; highly appropriate for business setting and situation; smooth, logical style.

WRITING CROSSWALK OF IDENTIFIED SKILL DESCRIPTIONS

ACT	SCANS	Coordinating Board Research	Department of Labor General Educational Development (G.E.D.)	Improvement for Undergraduate Education in Texas: College Level Competencies Fund for the Improvement of Postsecondary Education (F.I.P.S.E.)	Texas Academic Skills Program (T.A.S.P.)
3	F2-d	Use words appropriate for a specific audience and purpose.	*Level 4 Selection of wordage according to subject matter and audience.	Recognize the need to determine the level of detail to achieve a specific purpose. Recognize when ethical, emotional, or logical appeals are needed to achieve a specific purpose. Determine the information needed for the particular occasion. Determine appropriate purpose and rhetorical genre. Evaluate the process by which the information was collected and decide whether more is needed. Synthesize from unorganized data those ideas appropriate to the	I. Elements of Composition a. Recognize purpose and audience. This skill includes recognizing the appropriate purpose, audience, or occasion for a piece of writing; and recognizing writing that is appropriate for various purposes, audiences, or occasions.

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
				writing purpose, audience, and occasion.	
5	F2-f+	No close match found.	*Level 5 Study of the principles of inductive and deductive reasoning such as testing evidence, validity of generalizations, and cause and effect relationships to detect fallacies in arguments and to avoid these errors in own writing. (also in reading IIB, 4)	Recognize when information is readily available from personal experiences, readings, lectures, speeches or observations. Recognize when necessary information must come from other sources--a library or non-print sources including interviews or experimentation. Recognize when necessary information must be acquired through analysis of library work or other works of art. Organize those ideas into a logical and cohesive arrangement consistent with purpose, audience, and occasion. Develop an initial draft in which a controlling idea is supported in a unified and focused manner.	b. Recognize unity, focus, and development in writing. This skill includes recognizing unnecessary shifts in point of view or distracting details that impair the development of the main idea in a piece of writing and recognizing revisions that improve the unity and focus of a piece of writing.

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
				Re-evaluate the argument; eliminate any logical fallacies; clarify the distinction between fact and opinion.	
3	F2-a	Organize ideas in essay form.	*Level 5	Use techniques such as looping, listing, or brainstorming to generate ideas.	c. Recognize effective organization in writing.
3	F2-c	Compose logical and understandable correspondence and reports.	Develop a sequential and descriptive style of writing. Study and application of theory of dramatic writing.	Use systems such as rhetorical topics, pentad, or cubing to explore knowledge of a subject.	This skill includes methods of paragraph organization and the appropriate use of transitional words or phrases to convey text structure, and reorganizing sentences to improve cohesion and the effective sequence of ideas (coherence, logical order, transition)
4	F2-a	Interpret ideas in terms of one's own viewpoint or values.	Develop a free and independent skill in writing, based on own knowledge and experience.	Develop an initial draft in which a controlling idea is supported in a unified and focused manner.	
4	F2-a	State one's position in a clear, logical manner.			
5	F2-e	Defend one's point of view convincingly.	Study of the Collection, arrangement, and expression of subject matter to persuade or instill an acceptance of ideas in the mind of the reader.	Provide transitions among various components.	
3	F2-e	Compile materials supplied by others into a single report.		Re-evaluate the organization; determine whether the text has been effectively presented and adequately elaborated.	
2	F2-e	Combine sentences through logical subordination.	Analysis and practice of expository techniques with emphasis on organization of material and development of unity.		
3	F2-e	Compile notes taken from several sources into a documented report.			

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
3	F2-f	Use words effectively that indicate a transition from one idea to another.			
3	F2-f	Distinguish between complete sentences and fragments.	*Level 2 Learn to use mature sentence forms (compound and complex) with variation of word order in phrases, clauses, and sentences. Introduction to compound subject and predicate; agreement of subject and verb. Write reports on class discussions, hobbies, and trips, with *emphasis on variety of sentence structure, grammar, selection of words to clearly express thought, and reinforcing and increasing vocabulary*. Make outlines; practice techniques of letter writing and news writing.	Incorporate language and style appropriate to a given purpose, audience, and occasion. Re-evaluate the style; carry out necessary revisions including attention to matters of cohesion, consistency of point of view, appropriate language, and effective sentence structure.	2. Sentence Structure, Usage, and Mechanics a. Recognize effective sentences. This skill includes recognizing ineffective repetition and inefficiency in sentence construction; identifying sentence fragments and run-on sentences; identifying standard subject-verb agreement; identifying standard placement of modifiers, parallel structure, and use of negatives in sentence formation; and recognizing imprecise and inappropriate word choice.
3	F2-f	Use verbs that agree with subjects.			
3	F2-c	Construct a logical outline.			
3	F2-f	Use correct idioms.			
3	F2-a	Write clear, correct statements to fill out forms accurately.			
3	F2-f	Use words effectively which are opposite of one another.			
3	F2-f	Add proper beginnings and endings to words to change their meanings.			
3	F2-f	Use varied sentence structure.			
3	F2-f	Use appropriately words often confused because of similar sounds.			

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
3	F2-f	Use citations correctly.	*Level 3		
5	F2-f	Review and edit others' correspondence, directions, and reports.	Prepare themes, reports, and essays, with greater emphasis placed on punctuation, spelling, grammar, format, style, neatness, arrangement, and comprehensive coverage of subject matter.		
5	F2-f		Learn normal inverted word order, contractions, agreement of subject and verbs.		
			*Level 4		
4	F2-f		Mastery and facility in the use of the rules and concepts of person, gender, number, case, tense and mood.		
4	F2-f		Adjectives: common, proper, descriptive, limiting, articles position in sentence; comparative degrees.		
4	F2-f		Preparation of outlines; preparation of themes, emphasizing length, harmony, sequence, and variety of sentences and paragraph structure.		

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
4	F2-f		Coordination, subordination and parallelism of thoughts.		
			*Level 2	Create and sustain the interest of the reader by effective stylistic decisions in diction, usage, and sentence structure. Proofread for adherence to conventions of edited American English.	b. Recognize edited American English usage. This skill includes recognizing the standard use of verb forms and pronouns; recognizing the standard formation and use of adverbs, adjectives, comparatives, superlatives, and plural and possessive forms of nouns; and recognizing standard punctuation.
3	F2-f	Using plural words correctly.	Punctuation of the apostrophe, hyphen, and colon.		
3	F2-f	Use of appropriate contractions with apostrophe.	Introduction to comparison of objectives and adverbs; common and proper nouns; personal pronouns, singular and plural forms.		
3	F2-f	Punctuate one's own correspondence.			
3	F2-f	Use apostrophes correctly to show the possessive form of nouns.			
3	F2-f	Use the correct tenses of verbs.			
3	F2-f	Capitalize words correctly.	*Level 3		
3	F2-f	Spell correctly.	Punctuation: Comma, colon, semi-colon, dash, parentheses, quotation marks, hyphen, abbreviations.		
4	F2-f	Use correct abbreviations of words.			
4	F2-f	Distinguish between homonyms.	Learn to diagram sentences.		

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
5	F2-f	Use appropriate definitions for words with more than one meaning.	Learn pronouns, and antecedents.		
5	F2-f		Learn concepts of person, gender, number, case, tense, mood, and voice.		
5	F2-f		Learn kinds of verbs, nouns, pronouns, adjectives, adverbs, conjunctions, prepositions.		
			*Level 4		
4	F2-4		*Parts of Speech:* Verbs: strong and weak, transitive and intransitive, auxiliary, regular. Conjugation. Nouns: Common and proper, collective, concrete and abstract inflections, gender. Pronouns: Personal, demonstrative, relative, numerical, reciprocal.		

ACT	SCANS	C.B.R	G.E.D.	F.I.P.S.E.	T.A.S.P.
			Adverbs: Simple, conjunctive; forms; comparisons.		
			Conjunctions: Coordinating, subordinating		
			Prepositions.		
			Interjections.		
			Review and mastery of all rules of punctuation and capitalization.		

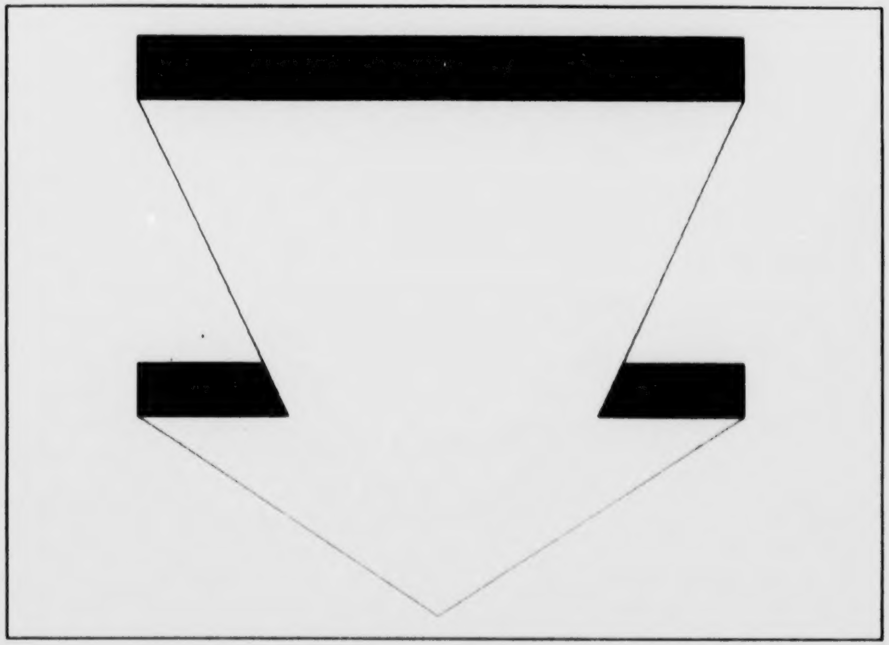
TABLE F

TASK ANALYSIS CROSSWALK

PSYCHOMOTOR

125

126



DC CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.11): *Fabricate and demonstrate DC series circuits. EEC 1004, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**:communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computerto process information **Systems: understands systems;monitors/corrects performance;improves; Technology: Selects/Applies**
1. Define a series circuit.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	Thinking Skills: All Personal Qualities: All	
2. Calculate total resistance, total current and the polarity of the IR drops in series circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Describe the difference between a voltage rise and a voltage drop, and the use of ground as a reference point.			SAME	SAME	SAME	
4. Analyze the use of voltage dividers or alternators to provide several different voltages from one source.			SAME	SAME	SAME	
5. List the power distribution rules for series circuits.			SAME	SAME	SAME	
6. Discover the effects of internal resistance on maximum power transfer from source to load.			SAME	SAME	SAME	
7. Construct series circuits to verify calculations.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD B.12: *Troubleshoot DC series circuit. EEC 1004, Unit 12

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Test to: 1. Assembly component level 2. Board level 3. Component level Tasks: 1. Test a. power sources b. passive circuit elements 2. Measure a. current b. power c. resistance d. voltage 3. Analyze problem			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 6 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others;** **Leadership**:communicates ideas to justify position, persuades/ convinces;responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/** Maintains/troubleshoots

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD B.14: *Fabricate and demonstrate DC parallel circuits. EEC 1004, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies**
1. Define a parallel circuit.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Calculate total current in parallel circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Calculate total resistance in parallel circuits			SAME	SAME	SAME	
4. Analyze power distribution in parallel circuits.			SAME	SAME	SAME	
5. Construct parallel circuits and make measurements to verify previous calculations.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Occupation: Electronic Technician
Duty Area/Function: All

Task Analysis Worksheet

IF SKILL STANDARD (B.15): Troubleshoot and repair DC parallel circuits. EEC 1004, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks:						
1. Define a parallel circuit.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/** **corrects performance; improves;** **Technology: Selects/Applies**
2. Calculate total current in parallel circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Calculate total resistance in parallel circuits			SAME	SAME	SAME	
4. Analyze power distribution in parallel circuits.			SAME	SAME	SAME	
5. Construct parallel circuits			SAME	SAME	SAME	
6. Make measurements to verify previous calculations.			SAME	SAME	SAME	
7. Explain the effects of opens in parallel circuits. (Troubleshooting)			SAME	SAME	SAME	
8. Explain the effects of shorts in parallel circuits. (Troubleshooting)			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.17): *Fabricate and demonstrate DC series parallel and bridge circuits. EEC 1004, Unit 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology**: Selects/Applies
1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4		
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Construct series parallel circuits.			SAME	SAME	SAME	
7. Make measurements to verify calculations.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.18): *Troubleshoot and repair DC series parallel and bridge circuits. EEC 1004, Unit 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; Interpersonal: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** Technology: **Selects/ Applies/ maintains/troubleshoots**
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Analyze the effects of opens in series parallel circuits (Troubleshooting)			SAME	SAME	SAME	
7. Analyze the effects of shorts in series parallel circuits (Troubleshooting)			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.20): *Fabricate and demonstrate DC voltage divider circuits (Loaded and Unloaded) EEC 1004, Unit 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies**
1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Construct series parallel circuits.			SAME	SAME	SAME	
7. Make measurements to verify calculations.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Occupation: Electronic Technician
Duty Area/Function: All

Task Analysis Worksheet

EIF SKILL STANDARD (B.21): *Troubleshoot and repair DC voltage divider circuits (Loaded and Unloaded)) EEC 1004, Unit 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/ maintains/troubleshoots**
1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Analyze the effects of opens in series parallel circuits (Troubleshooting)			SAME	SAME	SAME	
7. Analyze the effects of shorts in series parallel circuits (Troubleshooting)			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.23): *Fabricate and demonstrate DC RC and RL circuits. EEC 1004, Unit 14

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal & systems competencies/skills required)
Performance Skills						
Tasks: 1. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time:** Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** Selects/Applies/maintains
2. Calculate charge/discharge times for RC circuits.			SAME	SAME	SAME	
3. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
4. Graph the different charging times based on time constants.			SAME	SAME	SAME	
5. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
6. Calculate time constants for RL circuits.			SAME	SAME	SAME	
7. Discuss the voltage transients produced in RL circuits.			SAME	SAME	SAME	
8. Analyze the universal time constant curve.			SAME	SAME	SAME	
9. Observe the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME		
10. Observe the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.23): *Fabricate and demonstrate DC RC and RL circuits. EEC 1004, Unit 14

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal & systems competencies/skills required)**
Performance Skills						
Tasks: 1. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**
2. Calculate charge/discharge times for RC circuits.			SAME	SAME	SAME	
3. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
4. Graph the different charging times based on time constants.			SAME	SAME	SAME	
5. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
6. Calculate time constants for RL circuits.			SAME	SAME	SAME	
7. Discuss the voltage transients produced in RL circuits.			SAME	SAME	SAME	
8. Analyze the universal time constant curve.			SAME	SAME	SAME	
9. Observe the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME		
10. Observe the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	
11. Construct circuits to verify the calculated RC and RL time constrants.			SAME	SAME	SAME	

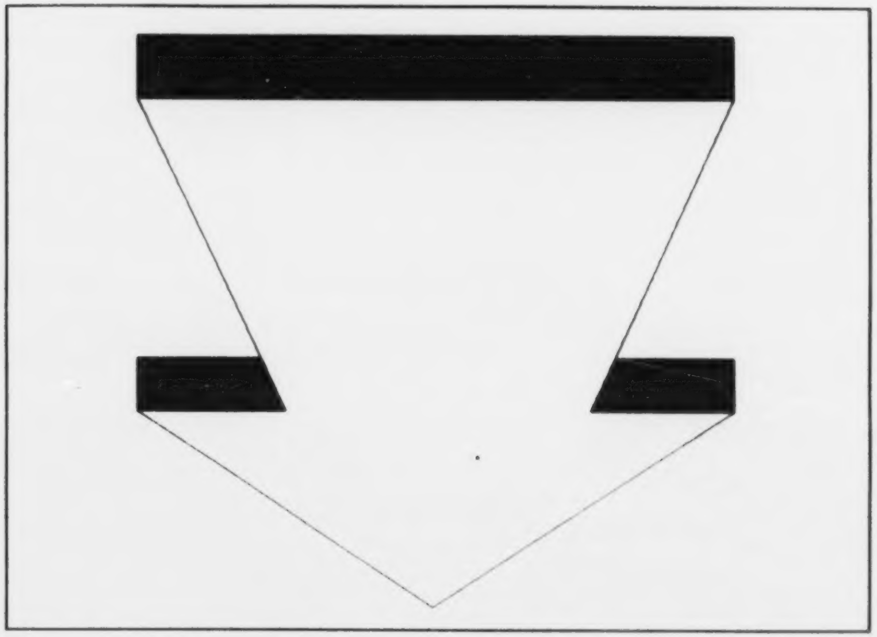
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.24): *Troubleshoot and repair DC RC and RL circuits. EEC 1004, Unit 14

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Calculate time constrants and charge/discharge times for RC circuits and the effects of R and C on charging time.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/ maintains/troubleshoots**
2. Graph the different charging times based on time constants and voltage amplitude.			SAME	SAME	SAME	
3. Calculate time constants for RL circuits and discuss the voltage transients produced in RL circuits.			SAME	SAME	SAME	
4. Analyze the universal time constant curve and its application to the study of RC and RL time constant circuits.			SAME	SAME	SAME	
5. Observe the effects of long and short time constants on square wave voltages			SAME	SAME	SAME	
6. Construct circuits to verify the calculated RC and RL time constants.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)



AC CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.08): *__Fabricate and demonstrate AC capacitive circuits.__ EEC 1104, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems:** **understands systems; improves;** **Technology:** **Selects/Applies**
1. Construct capacitive circuits.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4		
2. Measure currents.			SAME	SAME	SAME	
3. Measure voltage.			SAME	SAME	SAME	
4. Measure reactance.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.08): *Troubleshoot and repair AC capacitive circuits. EEC 1104, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Calculate capacitive reactance.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; improves;** **Technology**: **Selects/Applies/** maintains/troubleshoots
2. Calculate total reactances for series circuits.			SAME	SAME		
3. Calculate total reactances for parallel circuits.			SAME	SAME	SAME	
4. Graph the relationship between capacitive reactance and frequency.			SAME	SAME	SAME	
5. Determine the phase relationship between voltage and current in a capacitive circuit.			SAME	SAME	SAME	
6. Evaluate power in a purely capacitive circuit.			SAME	SAME	SAME	
7. Manipulate equations and solve problems associated with reactive circuits.			SAME	SAME	SAME	
8. Construct capacitive circuits.			SAME	SAME	SAME	
9. Measure currents.			SAME	SAME	SAME	
10. Measure voltage.			SAME	SAME	SAME	
11. Measure reactance.			SAME	SAME	SAME	
12. Simulate opens and shorts.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C11): *Fabricate and demonstrate AC inductive circuits. EEC 1104, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks:						
1. Construct inductive circuits			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems****: understands systems; improves;** **Technology:** **Selects/Applies**/maintains/ troubleshoots
2. Measure currents.			SAME	SAME	SAME	
3. Measure voltage.			SAME	SAME	SAME	
4. Measure reactance.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.12): *Troubleshoot and repair AC inductive circuits. EEC 1104, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks: 1. Construct inductive circuits			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; improves; Technology: Selects/Applies/** maintains/troubleshoots
2. Measure currents.			SAME	SAME	SAME	
3. Measure voltage.			SAME	SAME	SAME	
4. Measure reactance.			SAME	SAME	SAME	
5. Simulate faults			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.14): *Fabricate and demonstrate AC circuits using transformers. EEC 1104, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Explain principles of mutual inductance 2. Explain coefficient of coupling 3. Calculate turns ratio for current 4. Calculate turns ratio for voltage 5. Calculate turns ratio for impedance 6. Determine losses (core, current)			ACT Level 4 SCANS F1-b SAME SAME SAME SAME	ACT Level 6 SCANS F3 & F4 SAME SAME SAME SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME SAME SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; improves;** **Technology:** **Selects/Applies**/maintains/ troubleshoots

*(Build the product/device/circuit and show that it performs as expected)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

E/F SKILL STANDARD (C.15): *Troubleshoot and repair AC circuits using transformers. EEC 1104, Unit 7

Technology	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills					
Tasks: Apply principles of:				ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; improves;** **Technology:** **Selects/Applies**/maintains/ troubleshoots
1. Compare relationship of voltage, current, power and impedance to turns ratios.		ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4		
2. Identify the various losses of transformers and inductors.		SAME	SAME	SAME	
3. Differentiate between core types.		SAME	SAME	SAME	
4. Differentiate between the application of each type.		SAME	SAME	SAME	
5. Identify the symbols for each core type.		SAME	SAME	SAME	
6. Analyze the loading effect.		SAME	SAME	SAME	
7. Analyze the impedance transformation characteristics.		SAME	SAME	SAME	
8. Analyze the characteristics of Radio Frequency Transformers.		SAME	SAME	SAME	
9. Analyze the applications of Radio Frequency Transformers.		SAME	SAME	SAME	
10. Explain the Transformer Connections for Three Phase Circuits.		SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a produce/device/circuit, replace and/or repair the defect and demonstrate corrected operation)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.17): ***Fabricate and demonstrate AC differentiator and integrator circuits** EEC 1004, Unit 14

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal**: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/Applies/maintains**
1. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	SCANS: Thinking Skills: All	
2. Calculate charge/discharge times for RC circuits.			SAME	SAME	Personal Qualities: All	
3. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
4. Graph the different charging times based on time constants.			SAME	SAME	SAME	
5. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
6. Calculate time constants for RL circuits.			SAME	SAME	SAME	
7. Explain the voltage transients produced in RL circuits.			SAME	SAME	SAME	
8. Analyze the universal time constant curve.			SAME	SAME	SAME	
9. Explain the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME	SAME	
10. Document the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	
11. Construct circuits to verify the calculated RC and RL time constants.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.18): *Troubleshoot and repair AC differentiator and integrator circuits EEC 1004, Unit 14

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;** **Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems:** **understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Calculate charge/discharge times for RC circuits.			SAME	SAME	SAME	
3. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
4. Graph the different charging times based on time constants.			SAME	SAME	SAME	
5. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
6. Calculate time constants for RL circuits.			SAME	SAME	SAME	
7. Explain the voltage transients produced in RL circuits.			SAME	SAME	SAME	
8. Analyze the universal time constant curve.			SAME	SAME	SAME	
9. Explain the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME	SAME	
10. Document the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	
11. Construct circuits to verify the calculated RC and RL time constants.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.20): *__Fabricate and demonstrate AC series and parallel resonant circuits__ **(PAGE 1 OF 2)**, EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Explain Resonance.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	__Resources__: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; __Interpersonal:__ **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; __Information__: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information __Systems__: **understands systems; monitors/corrects performance; improves;** __Technology__: **Selects/Applies/ maintains**
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.20): *Fabricate and demonstrate AC series and parallel resonant circuits (PAGE 2 OF 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
10. Analyze the frequency response curves of a resonant circuit.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
11. Analyze the Bandwidth of a resonant circuit.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
12. Analyze the Bandpass of a resonant circuit.			SAME	SAME	SAME	
13. Analyze the relative amplitudes of the voltages, currents and impedances used to establish the limits of the curves.			SAME	SAME	SAME	
14. Evaluate Tuning, Bandspreading and the advantages of Multiple Tuned Stages.			SAME	SAME	SAME	
15. Construct circuit for both series/ parallel resonant circuit.			SAME	SAME	SAME	
16. Measure current, voltages to establish frequency response curves.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.21): *Troubleshoot and repair AC series and parallel resonant circuits **(PAGE 1 OF 2)** EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Explain Resonance.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (C. 21): *Troubleshoot and repair AC series and parallel resonant circuits (PAGE 2 OF 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
10. Analyze the frequency response curves of a resonant circuit.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
11. Analyze the Bandwidth of a resonant circuit.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
12. Analyze the Bandpass of a resonant circuit.			SAME	SAME	SAME	
13. Analyze the relative amplitudes of the voltages, currents and impedances used to establish the limits of the curves.			SAME	SAME	SAME	
14. Evaluate Tuning, Bandspreading and the advantages of Multiple Tuned Stages.			SAME	SAME	SAME	
15. Construct circuit for both series/ parallel resonant circuit.			SAME	SAME	SAME	
16. Measure current, voltages to establish frequency response curves.			SAME	SAME	SAME	
17. Simulate faults.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (C.23): ***Fabricate and demonstrate AC RC RL and RLC circuits. (PAGE 1 OF 2)** EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains**
1. Explain Resonance.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (C.23): *Fabricate and demonstrate AC RC, RL, and RLC circuits. (C.23) EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
10. Analyze the frequency response curves of a resonant circuit.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4		
11. Analyze the Bandwidth of a resonant circuit.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
12. Analyze the Bandpass of a resonant circuit.			SAME	SAME	SAME	
13. Analyze the relative amplitudes of the voltages, currents and impedances used to establish the limits of the curves.			SAME	SAME	SAME	
14. Evaluate Tuning, Bandspreading and the advantages of Multiple Tuned Stages.			SAME	SAME	SAME	
15. Construct circuit for both series/ parallel resonant circuit.			SAME	SAME	SAME	
16. Measure current, voltages to establish frequency response curves.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.24): *Troubleshoot and repair AC RC, RL, and RLC circuits. (Page 1 of 2) EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Explain Resonance.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.2B): *__Fabricate and demonstrate AC frequency selective filter circuits.__* **(Page 1 of 2)** EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Explain Resonance.			ACT Level 5 SCANS F3 & F4	ACT Level 6 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	SAME	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.28): *Fabricate and demonstrate AC series and parallel resonant circuits (PAGE 2 OF 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
10. Analyze the frequency response curves of a resonant circuit.			ACT Level 5 SCANS F3 & F4	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
11. Analyze the Bandwidth of a resonant circuit.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
12. Analyze the Bandpass of a resonant circuit.			SAME	SAME	SAME	
13. Analyze the relative amplitudes of the voltages, currents and impedances used to establish the limits of the curves.			SAME	SAME	SAME	
14. Evaluate Tuning, Bandspreading and the advantages of Multiple Tuned Stages.			SAME	SAME	SAME	
15. Construct circuit for both series/ parallel resonant circuit.			SAME	SAME	SAME	
16. Measure current, voltages to establish frequency response curves.			SAME	SAME	SAME	

***(Build the product/device/circuit and show that it performs as expected)**

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.27): *Troubleshoot and repair AC frequency selective filter circuits. (Page 1 of 2) EEC 1104, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Explain Resonance.			ACT Level 5 SCANS F3 & F4	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	SAME	SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.27): *Troubleshoot and repair AC frequency selective filter circuits. (PAGE 2 OF 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
10. Analyze the frequency response curves of a resonant circuit.			ACT Level 5 SCANS F3 & F4	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
11. Analyze the Bandwidth of a resonant circuit.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
12. Analyze the Bandpass of a resonant circuit.			SAME	SAME	SAME	
13. Analyze the relative amplitudes of the voltages, currents and impedances used to establish the limits of the curves.			SAME	SAME	SAME	
14. Evaluate Tuning, Bandspreading and the advantages of Multiple Tuned Stages.			SAME	SAME	SAME	
15. Construct circuit for both series/ parallel resonant circuit.			SAME	SAME	SAME	
16. Measure current, voltages to establish frequency response curves.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.29): *__Fabricate and demonstrate AC polyphase circuits.__ ELT 212,Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; Interpersonal:**Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** Technology: **Selects/Applies/maintains**
1. Check for the presence of proper voltages		DMM/WITH CLAMP ON PROBE	ACT Level 4 SCANS F1 b	ACT Level 4 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Replace fuses/circuit breakers or other devices.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.30): *__Troubleshoot and repair AC polyphase circuits.__ ELT 212, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 4 SCANS:	**__Resources__: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **__Interpersonal:__** **Team:** Participates as team; **teaches others; Leadership**: ommunicates ideas to justify position, persuades/ convinces; esponsibly challenges; **Works with Diversity**: works with others; **__Information__**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **__Systems__: understands systems; monitors/corrects performance; improves;** **__Technology:__** **Selects/Applies/maintains**
1. Check for the presence of proper voltages		DMM/WITH CLAMP ON PROBE	ACT Level 4 SCANS F1-b	ACT Level 4 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Replace fuses/circuit breakers or other devices			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.32): *__Fabricate and demonstrate AC phase locked loop circuits.__ ELT 212, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Components: a. Crystal controlled Ref oscillator b. Voltage controlled oscillator c. Phase detector d. Low pass filter e. D.C. amplifier			ACT Level 5 SCANS: F3 & F4	ACT Level 6 SCANS: F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**__Resources__: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **__Interpersonal:__** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **__Information__**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **__Systems__: understands systems; monitors/corrects performance; improves;** **__Technology:__** **Selects/Applies/maintains**
2. Comparison of AC phase relationships to produce error voltage			SAME	SAME	SAME	
3. Filtering and application of error voltage to VCo for FRPO correction			SAME	SAME	SAME	
(Note: most PLL circuits except for Crystals and frequency dividers are incorporated into integrated circuits.)						

*(Build the product/device/circuit and show that it performs as expected.)

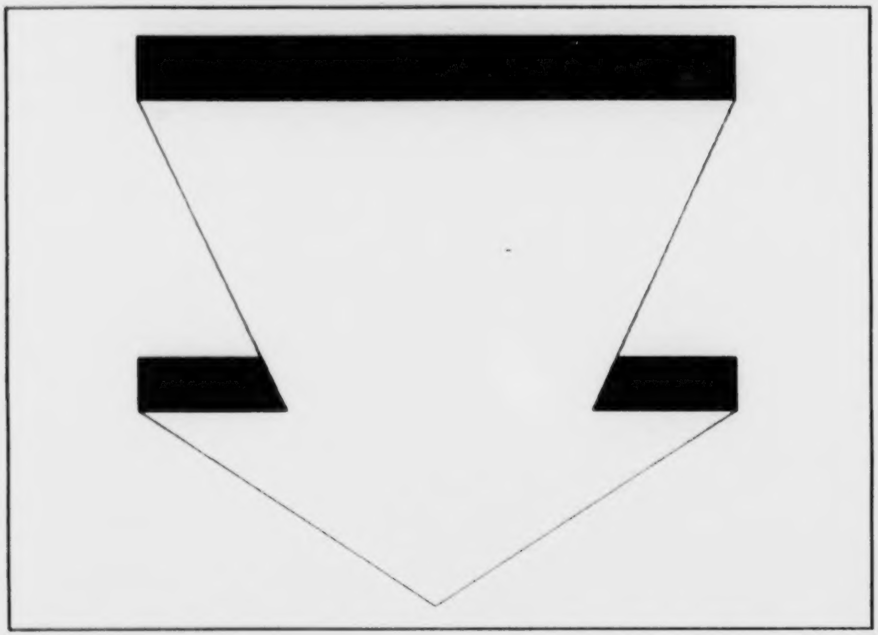
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.33): *Troubleshoot and repair AC phase locked loop circuits. ELT 212, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Components: a. Crystal controlled Ref oscillator b. Voltage controlled oscillator c. Phase detector d. Low pass filter e. D.C. amplifier			ACT Level 5 SCANS: F3 & F4	ACT Level 6 SCANS: F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; Interpersonal: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** Technology: **Selects/Applies/maintains**
2. Comparison of AC phase relationships to produce error voltage			SAME	SAME	SAME	
3. Filtering and application of error voltage to VCo for FRPO correction			SAME	SAME	SAME	
4. Change PLL IC or crystal or divider IC			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)



DISCRETE SOLID STATE DEVICES

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.07): *Fabricate and demonstrate diode circuits. EEC 1404, Unit 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Construct simple diode circuit		EIF 02,08,014,015,022	ACT Level 5 SCANS: F1 b	ACT Level 5 SCANS: F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Analyze simple diode circuit			SAME	SAME	SAME	
3. Take circuit voltage and current measurements			SAME	SAME	SAME	
4. Plot a diode's I E characteristic curve			SAME	SAME	SAME	
5. Recognize & construct clipper			SAME	SAME	SAME	
6. Recognize & construct clamper			SAME	SAME	SAME	
7. Recognize & construct multiplier circuits			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.08): *Troubleshoot and repair diode circuits. EEC 1404, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Determine whether or not a device (diode) is defective using an OHM METER 2. Construct, analyze and troubleshoot basic rectified circuits and basic power supply circuits.		EIF 02, 08, 014, 015, 022	ACT Level 5 SCANS: F1-b SAME	ACT Level 5 SCANS: F3 & F4 SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD: *Fabricate and demonstrate optoelectronic circuits (gate isolators, interrupt sensors, infra red sensors, etc.) EEC 1503, Unit 5

Technology Performance Skills		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Check parameters and ratings of photodiode			ACT Level 5 SCANS: F1-b	ACT Level 5 SCANS: F3 & F4		
2. Check the operation of a standard phototransister and compare it to the photo darlington transistor.			SAME	SAME	SAME	
3. Check operation of the photodetector & the LASCR			SAME	SAME	SAME	
4. Construct optoisolators & optointerrupters and check for operation and applications			SAME	SAME	SAME	
5. Calculate the wavelength of signal			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Occupation: Electronic Technician
Duty Area/Function: -

Task Analysis Worksheet

EIF SKILL STANDARD (D.11): *Troubleshoot and repair optoelectronic circuits (Gate isolators, Interrupt sensors, infra red sensors, etc.) EEC 1503, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						
1. Check parameters and ratings of photodiode			ACT Level 5 SCANS: F1-b	ACT Level 5 SCANS: F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Check the operation of a standard phototransister and compare it to the photo-darlington transistor.			SAME	SAME	SAME	
3. Check operation of the photodetector & the LASCR			SAME	SAME	SAME	
4. Construct optoisolators & optointerrupters and check for operation and applications			SAME	SAME	SAME	
5. Calculate the wavelength of signal			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD(D.13): *Fabricate and demonstrate single stage amplifiers. EEC 1404, Unit 5,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct a BJT base bias circuit, an emmitter bias & voltage divider bias CIR Circuit & demonstrate the Q point starlity for each		EIF 02, 08, 014, 015, 022	ACT Level 5 SCANS: F1 b	ACT Level 5 SCANS: F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Perform low & high frequency analysis of a BJT amplifer			SAME	SAME	SAME	
3. Perform gain calculations using decibels			SAME	SAME	SAME	
4. Construct a class c amplifier; calculate & measure the values of VB, VC, and VE			SAME	SAME	SAME	
5. Construct a simple JFET circuit, observe drain current while varying the gate-source voltage & use the data to plot a GM curve			SAME	SAME	SAME	
6. Construct a common source amplifier and perform circuit measurements and calculations.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.14): *Troubleshoot and repair single stage amplifiers. EEC 1404, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct a BJT base bias circuit, an emmitter bias & voltage divider bias CIR circuit & demonstrate the Q point starlity for each		EIF 02, 08, 014, 015, 022	ACT Level 5 SCANS: F1 b	ACT Level 5 SCANS: F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**
2. Perform low & high frequency analysis of a BJT amplifer			SAME	SAME	SAME	
3. Perform gain calculations using decibels			SAME	SAME	SAME	
4. Construct a class c amplifier; calculate & measure the values of VB, VC, and VE			SAME	SAME	SAME	
5. Construct a simple JFET circuit, observe drain current while varying the gate source voltage & use the data to plot a GM curve			SAME	SAME	SAME	
6. Construct a common source amplifier and perform circuit measurements and calculations.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.16): ***Fabricate and demonstrate thyristor circuitry (SCR, TRIAC, DIAC, etc.)** EEC 1503, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Build and analyze a simple SCR Phase controller circuit 2. Discuss the construction, operation and common applications for the DIAC & TRIAC		I 02, 08, 014, 015, 022	ACT Level 5 SCANS F1 b SAME	ACT Level 5 SCANS F3 & F4 SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.17): *Troubleshoot and repair thyristor circuitry (SCR, TRIAC, DIAC, etc.) EEC 1503, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Test a low power SCR with an OHM meter & discuss SCR circuit troubleshooting 2. Build and analyze a simple DIAC & TRIAC control circuit.		EIF 02, 08, 014, 015, 022	ACT Level 5 SCANS Level F1 b	ACT Level 5 SCANS Level F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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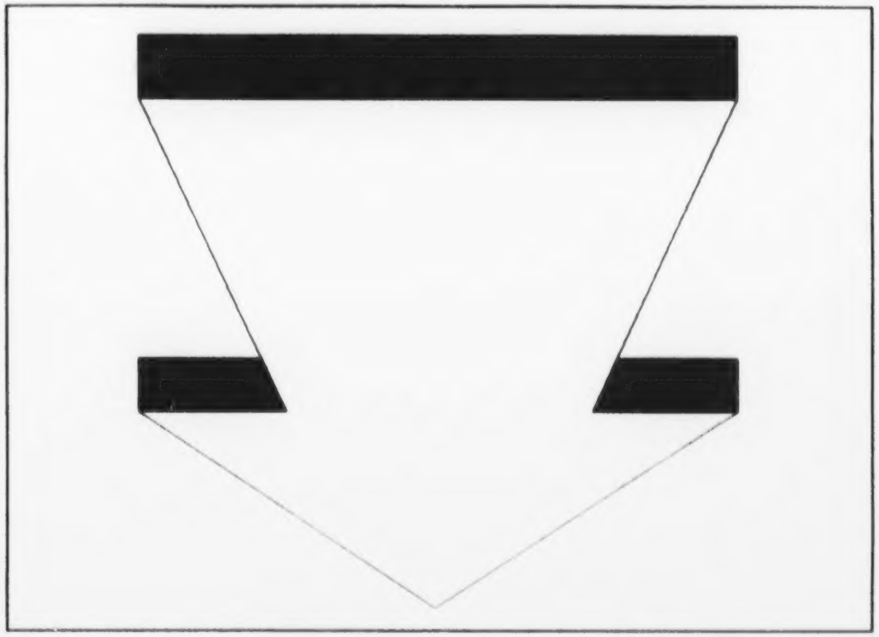

ANALOG CIRCUITS

Occupation: Electronic Technician
Duty Area/Function:

Task Analysis Worksheet

EIF SKILL STANDARD (E.02): *Fabricate and demonstrate multistage amplifiers. ELT 212, Unit 1

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, infor-mation, interpersonal and systems competencies/skills required)**
Performance Skills						
Tasks:						
1. Analyze the frequency spectrum and where the audio range fits into the spectrum.		Function Gen., Omm, Scope, Proto Board, components, hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**:communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Distinguish between voltage and power amplifiers and the various types of devices used in these circuits.			SAME	SAME	SAME	
3. Differentiate between the different classes of amplifiers (A, AB, R) and the biasing arrangements for each.			SAME	SAME	SAME	
4. Explain the functions of the transducers (microphones, earphones,loudspeakers) used in audio amplifiers.			SAME	SAME	SAME	
5. Identify the methods of coupling and impedance matching employed in audio amplifiers.			SAME	SAME	SAME	
6. Recognize single ended, push pull and complementary symmetry audio amplifier circuits and their characteristics.			SAME	SAME	SAME	
7. Analyze the use of inverse feed back for linearity control and the different methods employed in volume and tone control.			SAME	SAME	SAME	
8. Measure the effects of some typical transistor, operational amplifier and active bandpass filter circuits.			SAME	SAME	SAME	
9. Perform laboratory experiments and problem solving exercises in support of above tasks.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.03): *Troubleshoot and repair multistage amplifiers. ELT 212, Unit 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Analyze the frequency spectrum and where the audio range fits into the spectrum.		Function Gen., Omm, Scope, Proto Board, components, hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Distinguish between voltage and power amplifiers and the various types of devices used in these circuits.			SAME	SAME	SAME	
3. Differentiate between the different classes of amplifiers (A, AB, R) and the biasing arrangements for each.			SAME	SAME	SAME	
4. Explain the functions of the transducers (microphones, earphones, loudspeakers) used in audio amplifiers.			SAME	SAME	SAME	
5. Identify the methods of coupling and impedance matching employed in audio amplifiers.			SAME	SAME	SAME	
6. Recognize single ended, push pull and complementary symmetry audio amplifier circuits and their characteristics.			SAME	SAME	SAME	
7. Analyze the use of inverse feed back for linearity control and the different methods employed in volume and tone control.			SAME	SAME	SAME	
8. Measure the effects of some typical transistor, operational amplifier and active bandpass filter circuits.			SAME	SAME	SAME	
9. Perform laboratory experiments and problem solving exercises in support of above tasks.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.05): *Fabricate and demonstrate RF/IF circuits. (Page 1 of 2) ELT 212, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Select the proper RF amplifier for a specific application using the frequency voltage and power requirements.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Define the requirements, advantages/ disadvantages of the different biasing arrangements of RF amplifiers.			SAME	SAME	SAME	
3. List the different methods of coupling between RF stages and the advantages/ disadvantages/limitations of each.			SAME	SAME	SAME	
4. Recognize single ended/parallel/push pull operations and how to tune the output circuits of each configuration.			SAME	SAME	SAME	
5. Analyze the requirements for and the different methods of neturalizing RF amplifiers.			SAME	SAME	SAME	
6. Identify the characteristics of and requirements for frequency multiplier circuits in RF amplifier applications.			SAME	SAME	SAME	
7. Review method for determining values of L and C for resonant circuits.			SAME	SAME	SAME	
8. Explain the advantages of grounded grid (base gate) RF amplifiers and Pi network outputs.			SAME	SAME	SAME	
9. Analyze the special characteristics of UHF and VHF amplifiers.			SAME	SAME	SAME	
10. Examine transistor RF amplifiers and Pi-network output networks.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.05): *Fabricate and demonstrate RF/IF circuits. (Page 2 of 2)

Technology Performance Skills	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks:					
11. Practice the techniques of trouble shooting RF amplifier circuits.	SAME	SAME	SAME	SAME	SAME
12. Complete laboratory experiments and exercise problems to facilitate understanding of the above tasks.	SAME	SAME	SAME	SAME	SAME

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.06): *Troubleshoot and repair RF/IF circuits. (Page 1 of 2) ELT 212, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Select the proper RF amplifier for a specific application using the frequency voltage and power requirements.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Define the requirements, advantages/ disadvantages of the different biasing arrangements of RF amplifiers.			SAME	SAME	SAME	
3. List the different methods of coupling between RF stages and the advantages/ disadvantages/limitations of each.			SAME	SAME	SAME	
4. Recognize single ended/parallel/push pull operations and how to tune the output circuits of each configuration.			SAME	SAME	SAME	
5. Analyze the requirements for and the different methods of neturalizing RF amplifiers.			SAME	SAME	SAME	
6. Identify the characteristics of and requirements for frequency multiplier circuits in RF amplifier applications.			SAME	SAME	SAME	
7. Review method for determining values of L and C for resonant circuits.			SAME	SAME	SAME	
8. Explain the advantages of grounded grid (base gate) RF amplifiers and Pi network outputs.			SAME	SAME	SAME	
9. Analyze the special characteristics of UHF nad VHF amplifiers.			SAME	SAME	SAME	
10. Examine transistor RF amplifiers and Pi network output networks.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD(E.08): *Troubleshoot and repair RF/IF circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						
11. Practice the techniques of trouble shooting RF amplifier circuits.		SAME	SAME	SAME	SAME	SAME
12. Complete laboratory experiments and exercise problems to facilitate understanding of the above tasks.		SAME	SAME	SAME	SAME	SAME

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:
EIF SKILL STANDARD (E.08): *Fabricate and demonstrate linear power supplies and filters. (Page 1 of 3) EEC 1404, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks:		AC Source, DMM, Scope, Proto Board, Diodes and other components, hook up wire				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Explain the purpose of a power supply and list the circuits involved.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Explain the operation of the half wave rectifier/the full wave rectifier/bridge rectifier.			SAME	SAME	SAME	
3. Calculate the peak and DC average output voltage and current for any rectifier circuit.			SAME	SAME	SAME	
4. Discuss the effects that filtering has on a rectifier circuit.			SAME	SAME	SAME	
5. Determine the PIV for a diode in any rectifier circuit.			SAME	SAME	SAME	
6. Calculate the current/voltage values for a filtered rectifier circuit.			SAME	SAME	SAME	
7. Explain the operation of a shunt zener regulator and calculate the values of its voltages and currents.			SAME	SAME	SAME	
8. Construct, analyze, and trouble shoot basic rectifier circuits and basic power supply circuits.			SAME	SAME	SAME	
9. State the basic operation of clippers, clampers, and voltage multipliers and the purposes served by each.			SAME	SAME	SAME	
10. Discuss the use of clippers for transient protection.			SAME	SAME	SAME	
11. Describe the operation of an AM diode detector circuit.			SAME	SAME	SAME	
12. Discuss the use of LEDs as level indicators.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.08): *Fabricate and demonstrate linear power supplies and filters. (Page 2 of 3)

Technology	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills					
Tasks:					
13. Explain the operation of the 7 segment display, the common cathode display and the common anode display.	SAME	SAME	SAME	SAME	SAME
14. Recognize the construct clipper, clamper and multiplier circuits	SAME	SAME	SAME	SAME	SAME
15. Draw circuit diagrams and their respective input and output waveforms for half wave rectifiers, full wave rectifiers, filtered rectifiers, clippers, and clampers.	SAME	SAME	SAME	SAME	SAME SAME
16. Define/calculate the line regulation rating of a given voltage regulator.	SAME	SAME	SAME	SAME	SAME
17. Define/calculate the load regulation rating of a given voltage regulator.	SAME	SAME	SAME	SAME	
18. Define/explain the single regulation rating of a given voltage regulator.	SAME	SAME	SAME	SAME	SAME
19. Compare/contrast the series regulator and the shunt regulator.	SAME	SAME	SAME	SAME	
20. Explain why the series regulator is preferred over the shunt regulator.	SAME	SAME	SAME	SAME	SAME
21. Explain the operation of the IC voltage regulator.	SAME	SAME	SAME	SAME	SAME
22. List the major parameters and ratings of an IC voltage regulator.	SAME	SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.08): *Fabricate and demonstrate linear power supplies and filters. (Page 3 of 3)

Technology Performance Skills		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks:						
23. Calculate the maximum allowable input voltage and the value of regulated output voltage for an adjustable IC regulator.		SAME	SAME	SAME	SAME	SAME
24. Construct/evaluate discrete voltage regulator circuits and IC regulator circuits.			SAME	SAME	SAME	SAME

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.09): *Troubleshoot and repair linear power supplies and filters. (Page 1 of 3) EEC 1404, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks: 1. Explain the purpose of a power supply and list the circuits involved.		AC Source, DMM, Scope, Proto Board, Diodes and other components, hook-up wire	ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Explain the operation of the half wave rectifier/the full wave rectifier/bridge rectifier.			SAME	SAME	SAME	
3. Calculate the peak and DC average output voltage and current for any rectifier circuit.			SAME	SAME	SAME	
4. Discuss the effects that filtering has on a rectifier circuit.			SAME	SAME	SAME	
5. Determine the PIV for a diode in any rectifier circuit.			SAME	SAME	SAME	
6. Calculate the current/voltage values for a filtered rectifier circuit.			SAME	SAME	SAME	
7. Explain the operation of a shunt zener regulator and calculate the values of its voltages and currents.			SAME	SAME	SAME	
8. Construct, analyze, and troubleshoot basic rectifier circuits and basic power supply circuits.			SAME	SAME	SAME	
9. State the basic operation of clippers, clampers, and voltage multipliers and the purposes served by each.			SAME	SAME	SAME	
10. Discuss the use of clippers for transient protection.			SAME	SAME	SAME	
11. Describe the operation of an AM diode detector circuit.			SAME	SAME	SAME	
12. Discuss the use of LEDs as level indicators.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.09): *Troubleshoot and repair linear power supplies and filters. (Page 2 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, infor mation, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						
13. Explain the operation of the 7 segment display, the common cathode display and the common anode display.		SAME	SAME	SAME	SAME	SAME
14. Recognize the construct clipper, clamper and multiplier circuits		SAME	SAME	SAME	SAME	SAME
15. Draw circuit diagrams and their respective input and output waveforms for half-wave rectifiers, full-wave rectifiers, filtered rectifiers, clippers, and clampers.		SAME	SAME	SAME	SAME	SAME
16. Define/calculate the line regulation rating of a given voltage regulator.		SAME	SAME	SAME	SAME	SAME
17. Define/calculate the load regulation rating of a given voltage regulator.		SAME	SAME	SAME	SAME	SAME
18. Define/explain the single regulation rating of a given voltage regulator.		SAME	SAME	SAME	SAME	SAME
19. Compare/contrast the series regulator and the shunt regulator.		SAME	SAME	SAME	SAME	SAME
20. Explain why the series regulator is preferred over the shunt regulator.		SAME	SAME	SAME	SAME	SAME
21. Explain the operation of the IC voltage regulator.		SAME	SAME	SAME	SAME	SAME
22. List/define the major parameters and ratings of an IC voltage regulator.		SAME	SAME	SAME	SAME	SAME

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: -

EIF SKILL STANDARD (E.09): *Troubleshoot and repair linear power supplies and filters. (Page 3 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						
23. Calculate the maximum allowable input voltage and the value of regulated output voltage for an adjustable IC regulator.		SAME	SAME	SAME	SAME	SAME
24. Construct/evaluate discrete voltage regulator circuits and IC regulator circuits.			SAME	SAME	SAME	SAME

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.11): *Fabricate and demonstrate operational amplifier circuits. (Page 1 of 2) ELT 2003, Unit 3

Technology Performance Skills	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks: 1. Operational amplifier a. Interpret a typical operational amplifier data sheet. b. Measure common operational amplifier parameters. c. Identify input and feedback elements and calculate the effects of feedback on the circuit.	Function generator, Scope, DMM, Proto Board, assorted op amps & components	ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F4 & F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Basic linear amplifier circuits Construct, predict the performances of, and demonstrate an understanding of the operation of the: 1) voltage follower; 2) non-inverting amplifier; 3) inverting amplifier; 4) 2-input summing amplifier; 5) difference amplifier.		SAME	SAME	SAME	
3. Differentiator and integrator Construct, predict the performances of, and demonstrate an understanding of the operation of the differentiator and integrator.		SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.11): *Fabricate and demonstrate operational amplifier circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 4. Non linear signal processing circuits Construct, predict the performances of, and demonstrate an understanding of the operation of the: 1) non inverting comparator; 2) sine to square wave converter; 3) window comparator; 4) precision half wave rectifier; 5) precision full wave rectifier.		Function generator, Scope, DMM, Proto Board, assorted op amps & components	ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F4 & F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	SAME
5. Generators Construct, predict the performance of, and demonstrate an understanding of the operation of the: 1) wien bridge sine wave oscillator; 2) square wave oscillator; 3) combination square and triangle wave generator.			SAME	SAME	SAME	
6. The Norton op amp a. Predict and demonstrate the effect of varying the bias of the Norton op amp. b. Construct, predict the per formances of, and demonstrate an understanding of the operation of the: 1) non-inverting AC amplifier; 2) inverting AC amplifier; 3) voltage controlled oscillator.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.12): *Troubleshoot and repair operational amplifier circuits. (Page 1 of 2) ELT 2003, Unit 3

Technology	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills					
Tasks: Remove and replace by: 1. Operational amplifier a. Interpret a typical operational amplifier data sheet. b. Measure common operational amplifier parameters. c. Identify input and feedback elements and calculate the effects of feedback on the circuit.	Function generator, Scope, DMM, Proto Board, assorted op amps & components	ACT Level 4 SCANS F1-d	ACT Level 6 SCANS F4 & F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems****: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Basic linear amplifier circuits Construct, predict the performances of, and demonstrate an understanding of the operation of the: 1) voltage follower; 2) non-inverting amplifier; 3) inverting amplifier; 4) 2 input summing amplifier; 5) difference amplifier.		SAME	SAME	SAME	
3. Differentiator and integrator Construct, predict the performances of, and demonstrate an understanding of the operation of the differentiator and integrator.		SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.12): *Troubleshoot and repair operational amplifier circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 4. Non linear signal processing circuits Construct, predict the performances of, and demonstrate an understanding of the operation of the: 1) non inverting comparator; 2) sine to square wave converter; 3) window comparator; 4) precision half wave rectifier; 5) precision full wave rectifier.		Function generator, Scope, DMM, Proto Board, assorted op amps & components	ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F4 & F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	SAME
5. Generators Construct, predict the performance of, and demonstrate an understanding of the operation of the: 1) wien bridge sine wave oscillator; 2) square wave oscillator; 3) combination square and triangle wave generator.			SAME	SAME	SAME	
6. The Norton op amp a. Predict and demonstrate the effect of varying the bias of the Norton op amp. b. Construct, predict the performances of, and demonstrate an understanding of the operation of the: 1) non inverting AC amplifier; 2) inverting AC amplifier; 3) voltage controlled oscillator.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.14): *Fabricate and demonstrate audio power amplifiers. ELT 212, Unit 1

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)**
Performance Skills						
Tasks: 1. Measure the effects of some typical transistor, operational amplifier and active bandpass filter circuits. 2. Discover the techniques of servicing both transistor and vacuum tube audio amplifiers.		a. Function generator b. DVM c. Scope d. Prob Board e. Voltage AMP trans. f. Power AMP trans. g. Asst. of AMB	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills:All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.15): *Troubleshoot and repair audio power amplifiers.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Measure the effects of some typical transistor, operational amplifier and active bandpass filter circuits. 2. Discover the techniques of servicing both transistor and vacuum tube audio amplifiers.		a. Function generator b. DVM c. Scope d. Prob Board e. Voltage AMP trans. f. Power AMP trans. g. Asst. of AMB	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills:All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.17): *Fabricate and demonstrate regulated and switching power supply circuits. EEC 1503, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Describe the physical construction/ schematic symbols/supply voltage polarities of the n channel junction FET and the p channel junction FET.			ACT Level 4 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Explain the relationship between gate-source voltage, channel width, drain current, and drain-source voltage.			SAME	SAME	SAME	
3. Interpret a set of drain curves and identify the ohmic region/pinch off/ constant current region.			SAME	SAME	SAME	
4. List the most important parameters of JFETs and state their significance.			SAME	SAME	SAME	
5. Define transconductance and plot a transconductance curve for a given JFET.			SAME	SAME	SAME	
6. Compare/contrast gate-bias, self bias and voltage-divider bias.			SAME	SAME	SAME	
7. Explain the common-source amplifier response to an AC input voltage.			SAME	SAME	SAME	
8. List the gain and impedance features of the common-drain amplifier.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.16): *__Troubleshoot and repair regulated and switching power supply circuits.__ EEC 1503, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Describe the physical construction/ schematic symbols/supply voltage polarities of the n channel junction FET and the p channel junction FET.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Explain the relationship between gate source voltage, channel width, drain current, and drain source voltage.			SAME	SAME	SAME	
3. Interpret a set of drain curves and identify the ohmic region/pinch off/ constant current region.			SAME	SAME	SAME	
4. List the most important parameters of JFETs and state their significance.			SAME	SAME	SAME	
5. Define transconductance and plot a transconductance curve for a given JFET.			SAME	SAME	SAME	
6. Compare/contrast gate bias, self bias and voltage divider bias.			SAME	SAME	SAME	
7. Explain the common source amplifier response to an AC input voltage.			SAME	SAME	SAME	
8. List the gain and impedance features of the common drain amplifier.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.20): *Fabricate and demonstrate active filter circuits. EEC 1104, Unit 6

Technology Performance Skills	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks: 1. Review Conventional filters made from passive devices: a. Low pass (1) RC (2) RL b. Hi pass (1) RC (2) RL c. Band Pass RLC d. Band Block or Stop RLC e. M Derived f. Constant K g. Low pass active filter using OP AMP & RC network (1) single pole (first order) (2) DB/decade roll off h. Hi pass active filter using OP AMP & RC networks (1) Single Pole (2) DB/decade roll off i. Band Pass using combination hi pass/low pass		ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computerto process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.21): *Troubleshoot and repair active filter circuits. EEC 1104, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Review - Conventional filters made from passive devices: a. Low pass (1) RC (2) RL b. Hi pass (1) RC (2) RL c. Band Pass - RLC d. Band Block or Stop - RLC e. M-Derived f. Constant K g. Low pass active filter using OP-AMP & RC network (1) single-pole (first order) (2) DB/decade roll-off h. Hi pass active filter using OP-AMP & RC networks (1) Single Pole (2) DB/decade roll-off i. Band Pass using combination hi pass/low pass j. OP-AMPS - PLUG IN (not repairable) k. Passive Components - Trouble shoot in normal manner - using DMM			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.23): *Fabricate and demonstrate sinusoidal and non-sinusoidal oscillator circuits. EEC 1503, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. List the requirements for proper operation of an oscillator.			ACT Level 4 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Describe the construction and operation of the phase shift oscillator.			SAME	SAME	SAME	
3. Explain how a multistage discrete amplifier can go into oscillation and how to prevent it.			SAME	SAME	SAME	
4. Describe the construction and operation of a Colpitts oscillator.			SAME	SAME	SAME	
5. Describe the construction and operation of a Clapp oscillator.			SAME	SAME	SAME	
6. Describe the construction and operation of a Hartley oscillator.			SAME	SAME	SAME	
7. Describe the construction and operation of a Armstrong oscillator.			SAME	SAME	SAME	
8. Compare the crystal-controlled oscillator with other types of LC oscillators.			SAME	SAME	SAME	
9. Determine if a given oscillator circuit fulfills the Barkhausen criterion by performing circuit calculations.			SAME	SAME	SAME	
10. Construct/troubleshoot a Colpitts oscillator and a Clapp oscillator.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.24): *Troubleshoot and repair sinusoidal and non sinusoidal oscillator circuits. EEC 1503, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. List the requirements for proper operation of an oscillator.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Describe the construction and operation of the phase shift oscillator.			SAME	SAME	SAME	
3. Explain how a multistage discrete amplifier can go into oscillation and how to prevent it.			SAME	SAME	SAME	
4. Describe the construction and operation of a Colpitts oscillator.			SAME	SAME	SAME	
5. Describe the construction and operation of a Clapp oscillator.			SAME	SAME	SAME	
6. Describe the construction and operation of a Hartley oscillator.			SAME	SAME	SAME	
7. Describe the construction and operation of a Armstrong oscillator.			SAME	SAME	SAME	
8. Compare the crystal-controlled oscillator with other types of LC oscillators			SAME	SAME	SAME	
9. Determine if a given oscillator circuit fulfills the Barkhausen criterion by performing circuit calculations.			SAME	SAME	SAME	
10. Construct/troubleshoot a Colpitts oscillator and a Clapp oscillator.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.28): ***Fabricate and demonstrate fiber optic circuits using photodiodes or LASERS.** TCC 2313, Unit 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Demonstrate a fundamental understanding of fiber optics. 2. Demonstrate an understanding of the application of fiber optics in electronics. 3. Explain refractive index and higher order modes. 4. Explain the characteristics of the fiber optics and signal attenuation. 5. Explain the physics of light generation. 6. Explain the characteristics of the laser diode and light emitting diode. 7. Explain the principle of opto-electronic transducers. 8. Explain the function of the essential components of any fiber optic system. 9. Perform experiments in fiber optic system. 10. Explain the characteristics of couplers and connectors. 11. Perform experiments using fiber optic couplers and connectors.		Scope, TDR, splicer, glass fibers, TXMIT & Rec. system	ACT Level 4 SCANS F1 d SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	ACT Level 6 SCANS F3 & F4 SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.27): *Troubleshoot and repair fiber optic circuits using photodiodes or LASERS. TCC 2313, Unit 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Demonstrate a fundamental under standing of fiber optics. 2. Demonstrate an understanding of the application of fiber optics in electronics. 3. Explain refractive index and higher order modes. 4. Explain the characteristics of the fiber optics and signal attenuation. 5. Explain the physics of light generation. 6. Explain the characteristics of the laser diode and light emitting diode. 7. Explain the principle of opto electronic transducers. 8. Explain the function of the essential components of any fiber optic system. 9. Perform experiments in fiber optic system. 10. Explain the characteristics of couplers and connectors. 11. Perform experiments using fiber optic couplers and connectors.		Scope, TDR, splicer, glass fibers, TXMIT & Rec. system	ACT Level 4 SCANS F1 d SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	ACT Level 6 SCANS F3 & F4 SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME SAME SAME SAME SAME SAME SAME SAME SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.29): *Fabricate and demonstrate signal modulation systems (AM, FM, stereo). (Page 1 of 3) ELT 212, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Define modulation and list the reasons for modulating an RF carrier.			ACT Level 4 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Explain the relationship between sound waves and the human ear and how the waves can be converted to electrical impulses and used to modulate an RF carrier.			SAME	SAME	SAME	
3. Analyze the modulation process, Absorption Modulation, Series modulation, Plate modulation, formation of the modulation envelope, and determination of percent of modulation.			SAME	SAME	SAME	
4. Evaluate plate modulation of the different types of vacuum tubes and how it affects operating power.			SAME	SAME	SAME	
5. Examine the effects of modulation on sideband generation and bandwidth.			SAME	SAME	SAME	
6. Identify the different types of modulation and classify them as High or Low level.			SAME	SAME	SAME	
7. Evaluate the other types of modulation to include Heising and the trhee types of Grid (control, screen, and suppressor) modulation.			SAME	SAME	SAME	
8. Calculate the percent of modulation using an oscilloscope.			SAME	SAME	SAME	
9. Perform laboratory experiments and problem solving exercises to facilitate understanding of modulation principles.			SAME	SAME	SAME	
10. Evaluate the components of an AM modulated radio signal.			SAME	SAME	SAME	
11. Analyze the procedures for detection and demodulation of an AM modulated wave.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.29): *Fabricate and demonstrate signal modulation systems (AM, FM, stereo). (Page 2 of 3) ELT 212, Unit 4

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)**
Performance Skills						
Tasks: 12. Describe the characteristics of and the differences between TR|F, Super regenerative, and Superheterodyne recievers.			ACT Level 4 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
13. Identify and compare the operational characteristics of RF, IF, and AF amplifiers.			SAME	SAME	SAME	
14. Explain the relationship between the number of RF and IF amplifiers and the S/N ratio of receivers.			SAME	SAME	SAME	
15. Determine how automatic volume control (AVC) voltages are generated through AM Detection circuits.			SAME	SAME	SAME	
16. Determine how automatic gain control (AGC) voltages are developed from CW and SS| demodulation.			SAME	SAME	SAME	
17. Analyze the make-up of image frequencies, their affects on received signals, and how they can be eliminated through the use of wave traps and filters.			SAME	SAME	SAME	
18. Explore the advantages of using double conversion superheterodyne receivers.			SAME	SAME	SAME	
19. Evaluate diversity reception (both frequency and space) to minimize selective fading.			SAME	SAME	SAME	
20. Practice the alignment procedures for AM recievers.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.29): *Fabricate and demonstrate signal modulation systems (AM, FM, stereo). (Page 3 of 3) ELT 212, Unit 4

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)**
Performance Skills						
Tasks: 21. Complete laboratory experiments and problem solving exercises to facilitate learning the objectives above.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
22. Define frequency modulation (FM) and discuss the five major applications of FM.			SAME	SAME	SAME	
23. Analyze the basic concepts of frequency modulation.			SAME	SAME	SAME	
24. List the main concepts of slope and phase locked loop detection.			SAME	SAME	SAME	
25. Describe the mechancis and applications of discriminators and detectors in FM demodulation.			SAME	SAME	SAME	
26. Explore the effects and requirements of FM IF limiter circuits.			SAME	SAME	SAME	
27. Analyze the application of pre emphasis and de emphasis, and squelch circuits in FM modulation and demodulation.			SAME	SAME	SAME	
28. Practice the proper procedures for aligningk FM receivers.			SAME	SAME	SAME	
29. Accomplish FM using a varactor diode circuit.			SAME	SAME	SAME	
30. Produce FM by the direct and indirect methods.			SAME	SAME	SAME	
31. Describe phase modulation techniques and how voice is used to accomplish PM.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.30): *Troubleshoot and repair signal modulation systems (AM, FM, stereo) Page 1 of 3) ELT 212, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Define modulation and list the reasons for modulating an RF carrier.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; Interpersonal: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: understands systems; monitors/ corrects performance; improves; Technology: Selects/Applies/maintains
2. Explain the relationship between sound waves and the human ear and how the waves can be converted to electrical impulses and used to modulate an RF carrier.			SAME	SAME	SAME	
3. Analyze the modulation process, Absorption Modulation, Series modulation, Plate modulation, formation of the modulation envelope, and determination of percent of modulation.			SAME	SAME	SAME	
4. Evaluate plate modulation of the different types of vacuum tubes and how it affects operating power.			SAME	SAME	SAME	
5. Examine the effects of modulation on sideband generation and bandwidth.			SAME	SAME	SAME	
6. Identify the different types of modulation and classify them as High or Low level.			SAME	SAME	SAME	
7. Evaluate the other types of modulation to include Heising and the trhee types of Grid (control, screen, and suppressor) modulation.			SAME	SAME	SAME	
8. Calculate the percent of modulation using an oscilloscope.			SAME	SAME	SAME	
9. Perform laboratory experiments and problem solving exercises to facilitate understanding of modulation principles.			SAME	SAME	SAME	
10. Evaluate the components of an AM modulated radio signal.			SAME	SAME	SAME	
11. Analyze the procedures for detection and demodulation of an AM modulated wave.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.30): *Troubleshoot and repair signal modulation systems (AM, FM, Stereo). (Page 2 of 3) ELT 212, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 12. Describe the characteristics of and the differences between TRIF, Super-regenerative, and Superheterodyne recievers.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
13. Identify and compare the operational characteristics of RF, IF, and AF amplifiers.			SAME	SAME	SAME	
14. Explain the relationship between the number of RF and IF amplifiers and the S/N ratio of receivers.			SAME	SAME	SAME	
15. Determine how automatic volume control (AVC) voltages are generated through AM Detection circuits.			SAME	SAME	SAME	
16. Determine how automatic gain control (AGC) voltages are developed from CW and SSI demodulation.			SAME	SAME	SAME	
17. Analyze the make-up of image frequencies, their affects on received signals, and how they can be eliminated through the use of wave traps and filters.			SAME	SAME	SAME	
18. Explore the advantages of using double conversion superheterodyne receivers.			SAME	SAME	SAME	
19. Evaluate diversity reception (both frequency and space) to minimize selective fading.			SAME	SAME	SAME	
20. Practice the alignment procedures for AM recievers.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.30): *Troubleshoot and repair signal modulation systems (AM, FM, stereo). (Page 3 of 3) ELT 212, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 21. Complete laboratory experiments and problem solving exercises to facilitate learning the objectives above.			ACT Level 4 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
22. Define frequency modulation (FM) and discuss the five major applications of FM.			SAME	SAME	SAME	
23. Analyze the basic concepts of frequency modulation.			SAME	SAME	SAME	
24. List the main concepts of slope and phase locked loop detection.			SAME	SAME	SAME	
25. Describe the mechancis and applications of discriminators and detectors in FM demodulation.			SAME	SAME	SAME	
26. Explore the effects and requirements of FM IF limiter circuits.			SAME	SAME	SAME	
27. Analyze the application of pre-emphasis and de-emphasis, and squelch circuits in FM modulation and demodulation.			SAME	SAME	SAME	
28. Practice the proper procedures for aligningk FM receivers.			SAME	SAME	SAME	
29. Accomplish FM using a varactor diode circuit.			SAME	SAME	SAME	
30. Produce FM by the direct and indirect methods.			SAME	SAME	SAME	
31. Describe phase modulation techniques and how voice is used to accomplish PM.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.31): *Demonstrate an understanding of motor phase shift control circuits.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: This is beyond the scope of currently taught communications courses. It is usually taught as part of radar or robotics courses.						Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; Interpersonal: **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: understands systems; monitors/ corrects performance; improves; Technology: Selects/Applies/maintains

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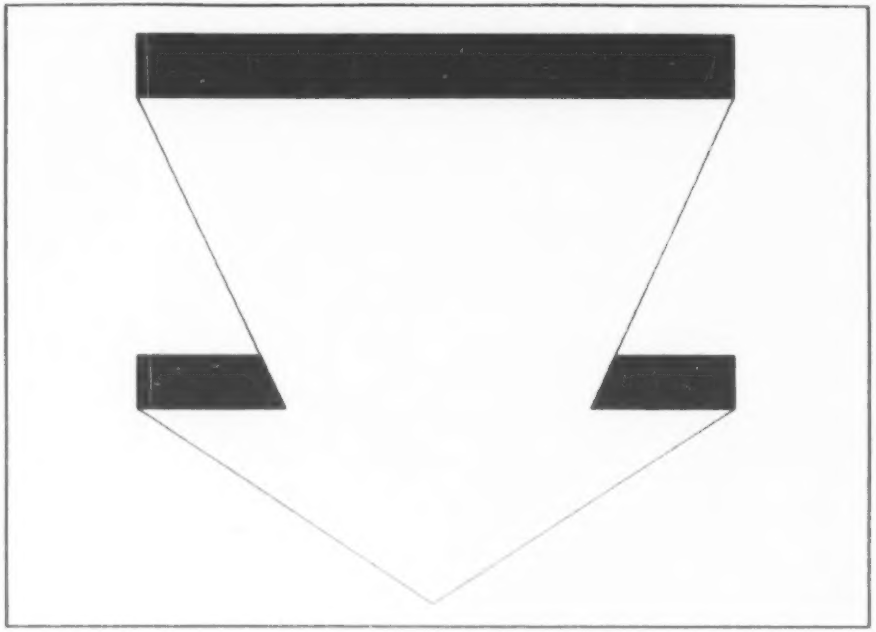
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.32: *Demonstrate an understanding of cathode ray tubes.

Technology Performance Skills	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Tasks: Understand cathode ray tubes (CRT) components and application of each: a. Heater b. Cathode c. Grid d. Intensity Control e. Focusing Anode Control f. Acceleration Anode g. Vertical deflection plates h. Horizontal deflection plates i. Aquadag coating j. Power supply k. Vertical AMPS l. Horizontal AMP and Sweep generator m. A.C. and D.C. imput functions n. XI XIO probes		ACT Level 4 SCANS F1b SAME	ACT Level 6 SCANS F3 & F4 SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
Free running O'Scopes a. Frequency measure b. Phase measure c. Lissaious pattere		SAME	SAME	SAME	
Triggered Scopes a. Timeback generator operation b. Frequency measurement (using Time Bar Generator		SAME	SAME	SAME	
Spectrum Analyzers a. Spacing of carrier, sideband, harmonics in frequency spectrum		SAME	SAME	SAME	



DIGITAL CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.04): "Fabricate and demonstrate linear integrated circuits. EEC 1203

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct & analyze A/D converters & circuits. 2. Construct & analyze D/A converter circuits.			ACT Level 5 SCANS Level F1 b SAME	ACT Level 4 SCANS F3 a SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.05): *Troubleshoot and repair linear integrated circuits. EEC 1203, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct, analyze and troubleshoot A/D converters & circuits. 2. Construct, analyze and troubleshoot D/A converters & circuits.			ACT Level 5 SCANS Level F1 b SAME	ACT Level 4 SCANS F3 a SAME	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology: Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.07): ***Fabricate and demonstrate types of logic gates.** EEC 1203, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct & analyze simple logic circuits for the following: AND, OR, NAND, NOR, NOT, inverter. (Use appropriate truth tables for each logic gate)			ACT Level 5 SCANS F1-a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.08): *Troubleshoot and repair types of logic gates. EEC 1203, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct, analyze and troubleshoot simple logic circuits for the following: AND, OR, NAND, NOR, NOT, inverter.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

(F.10): ***Fabricate and demonstrate combinational logic circuits.** EEC 1203, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct & analyze basic combinational logic circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.11): *Troubleshoot and repair combinational logic circuits. EEC 1203, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct, analyze and troubleshoot basic combinational logic circuits from a given schematic.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Occupation: Electronic Technician
Duty Area/Function:

Task Analysis Worksheet

EIF SKILL STANDARD (F.13): ***Fabricate and demonstrate types of flip-flop circuits.** EEC 1203, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct flip flop circuits & verify truth tables for different types of flip flops: D, JK, RS.			ACT Level 5 SCANS F1-a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.14): *Troubleshoot and repair flip flop circuits. EEC 1203, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct, analyze & troubleshoot flip flop circuits: D, JK, RS.			ACT Level 5 SCANS F1-a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time:** Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.16): *Fabricate and demonstrate types of registers and counters. EEC 1203, Unit 6, 5, 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Construct & analyze truth tables for registers.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Construct & analyze truth tables for counters.			SAME	SAME	SAME	
3. Construct & analyze registers: serial in/parallel out, serial in/serial out, and bidirectional.			SAME	SAME	SAME	
4. Construct and analyze counters as frequency dividers.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.17): *__Troubleshoot and repair types of registers and counters.__ EEC 1303, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Construct, analyze and troubleshoot register circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Construct, analyze and troubleshoot counter circuits.			SAME	SAME	SAME	
			SAME	SAME	SAME	
			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.19): *__Fabricate and demonstrate clock and timing circuits.__ EEC 1303, Unit 3, 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Construct & analyze one shot & multi vibrator circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Construct timing for synchronous & asynchronous counter circuits.			SAME	SAME	SAME	
			SAME	SAME	SAME	
			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.20): *Troubleshoot and repair clock and timing circuits. EEC 1303, Unit 3, 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Construct, analyze & troubleshoot one-shot & multi vibrator circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Construct, analyze, & troubleshoot synchronous & asynchronous counter circuits.			SAME	SAME	SAME	
			SAME	SAME	SAME	
			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.22): *Fabricate and demonstrate types of arithmetic-logic circuits EEC 1603, Unit 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks: 1. Build and analyze truth tables and timing diagrams of sum of products circuits. 2. Build and analyze truth tables and timing diagrams of product of sum circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1-a SAME SAME SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 4 SCANS F3 SAME SAME SAME (EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME SAME (EIF 043,044,045, 047,050)	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; Interpersonal: **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems:understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.23): *Troubleshoot and repair types of arithmetic logic circuits. CMT 1603, Unit 1

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)**
Performance Skills						
Tasks: 1. Build, analyze and debug sum of products circuits. 2. Build, analyze and debug product of sums circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1-a SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 4 SCANS F3 SAME (EIF 066,067,068,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME (EIF 043,044,045, 047,050)	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems****: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.25): *Fabricate and demonstrate types of multiplexer and demultiplexer circuits. EEC 1303, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks: 1. Build and analyze truth tables and timing diagrams of multiplexer circuits. 2. Build and analyze truth tables and timing diagrams of demultiplexer circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti-static equipment 9. Data book	ACT Level 5 SCANS F1-d SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME (EIF 066,067,068, 069,072,073,074,075, 076,077,078,082,084,085,086,087,089,090	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME (EIF 043,044,045, 047,050)	**Resources: Time**: Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.26): *Troubleshoot and repair types of multiplexer and demultiplexer circuits. EEC 1303, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
Performance Skills						
Tasks: 1. Build, analyze and debug multiplexer circuits. 2. Build, analyze and debug demultiplexer circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti-static equipment 9. Data book	ACT Level 5 SCANS F1-b SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME (EIF 066,067,068,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME (EIF 043,044,045, 047,050)	Resources: Time: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.28): *Fabricate and demonstrate types of digital to analog and analog to digital circuits. EEC 1203, Unit 6

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)**
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems:understands systems; monitors/ corrects performance; improves;** **Technology: Selects/Applies/maintains**
1. Analyze gates and their functions			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Construct truth tables			SAME	SAME	SAME	
3. Apply binary arithmetic			SAME	SAME	SAME	
4. Examine functional circuits			SAME	SAME	SAME	
5. Analyze counters			SAME	SAME	SAME	
6. Analyze multiplexers			SAME	SAME	SAME	
7. Analyze registers			SAME	SAME	SAME	
8. Analyze displays			SAME	SAME	SAME	
9. Analyze convertors (A to D, D to A)			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.29): *Troubleshoot and repair types of digital to analog and analog to digital circuits. EEC 1203, Unit 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	Resources: **Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; Interpersonal: **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: understands systems; monitors/ corrects performance; improves; Technology: Selects/Applies/maintains
1. Analyze gates and their functions			ACT Level 5 SCANS F1-a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Construct truth tables			SAME	SAME	SAME	
3. Apply binary arithmetic			SAME	SAME	SAME	
4. Examine functional circuits			SAME	SAME	SAME	
5. Analyze counters			SAME	SAME	SAME	
6. Analyze multiplexers			SAME	SAME	SAME	
7. Analyze registers			SAME	SAME	SAME	
8. Analyze displays			SAME	SAME	SAME	
9. Analyze convertors (A to D, D to A)			SAME	SAME	SAME	
10. Troubleshoot and repair			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.31): *Fabricate and demonstrate types of digital display circuits. EEC 1303, Unit 4

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)**
Performance Skills						
Tasks: 1. Build and analyze truth tables and timing diagrams of decoder driver circuits. 2. Build and analyze truth tables and timing diagrams of counter circuits. 3. Build and analyze segment display circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b SAME SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 4 SCANS F3 SAME SAME (EIF 066,067,068,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME (EIF 043,044,045, 047,050)	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.32): *__Troubleshoot and repair types of digital display circuits.__ EEC 1303, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Build, analyze and debug decoder driver circuits. 2. Build, analyze and debug counter circuits. 3. Build, analyze and debug segment display circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1-b SAME SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 4 SCANS F3 SAME SAME (EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME (EIF 043,044,045, 047,050)	**__Resources:__ Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **__Interpersonal:__** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **__Information__**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **__Systems__: understands systems; monitors/ corrects performance; improves;** **__Technology:__** **Selects/Applies/maintains**

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter/Administration

EIF SKILL STANDARD (F.34): *Fabricate and demonstrate digital power distribution and noise problems. EEC 1203, Unit 3

Technology	Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills					
Tasks: 1. Build and analyze propagation delay of logic circuits.	1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti-static equipment 9. Data book	ACT Level 5 SCANS F1-d	ACT Level 4 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Build and analyze power dissipation of logic circuits.		SAME	SAME	SAME	
3. Build and analyze Speed-Power trade off in logic circuits.		SAME	SAME	SAME	
4. Build and analyze noise immunity as percentage of supply voltage on digital circuits.		SAME	SAME	SAME	
5. Build and analyze fan outs of logic circuits.		SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	SAME (EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	SAME (EIF 043,044,045, 047,050)	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter/Administration

EIF SKILL STANDARD (F.35): *Troubleshoot and repair digital power distribution and noise problems. EEC 1203, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Build, analyze and debug propagation delay problems of logic circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal-relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Build, analyze and debug power dissipation problem of logic circuits.			SAME	SAME	SAME	
3. Build, analyze and debug Speed Power trade off problems in logic circuits.			SAME	SAME	SAME	
4. Build, analyze and debug noise immunity problems as percentage of supply voltage in digital circuits.			SAME	SAME	SAME	
5. Build, analyze and debug fan out problems of digital logic circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,068,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.37): *__Fabricate and demonstrate types of digital encoders and decoders.__ EEC 1303, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book			ACT Level 5 SCANS:	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Build and analyze BCD to Decimal decoders circuits.			ACT Level 5 SCANS f1-d	ACT Level 5 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Build and analyze Octal decoders circuits.			SAME	SAME	SAME	
3. Build and analyze Hex decoders circuits.			SAME	SAME	SAME	
4. Build and analyze BCD to 7 Segment decoder circuits.			SAME	SAME	SAME	
5. Build and analyze simple encoder circuits.			SAME	SAME	SAME	
6. Build and analyze Decimal to BCD encoder circuits.			SAME	SAME	SAME	
7. Build and analyze 8 input priority encoder circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: ALL

EIF SKILL STANDARD (F.38): *Troubleshoot and repair types of digital encoders and decoders. EEC 1303, Unit 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Build, analyze and debug BCD to Decimal decoders circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti-static equipment 9. Data book	ACT Level 5 SCANS f1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Build, analyze and debug Octal decoders circuits.			SAME	SAME	SAME	
3. Build, analyze and debug Hex decoders circuits.			SAME	SAME	SAME	
4. Build, analyze and debug BCD to 7-Segment decoder circuits.			SAME	SAME	SAME	
5. Build, analyze and debug simple encoder circuits.			SAME	SAME	SAME	
6. Build, analyze and debug Decimal to BCD encoder circuits.			SAME	SAME	SAME	
7. Build, analyze and debug 8 input priority encoder circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027: Writing EIF 082)	(EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: ALL

EIF SKILL STANDARD (F.40): *Fabricate and demonstrate digital display devices.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: – Incomplete in offering						

*(Build the product/device/circuit and show that it performs as expected.)

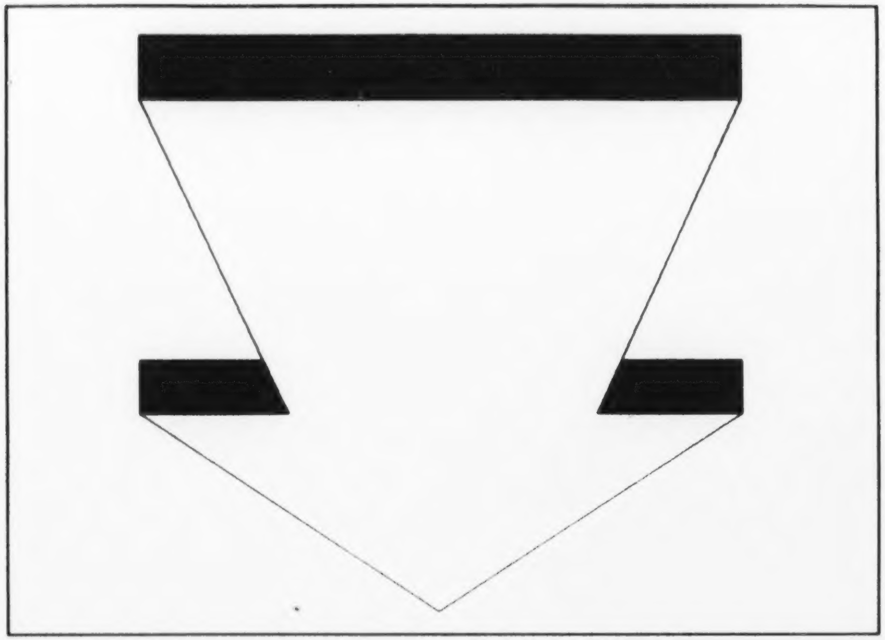
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.41): *Troubleshoot and repair digital display devices.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:						

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)



MICROPROCESSORS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (G.09): *Fabricate and demonstrate types of microprocessor memory circuits. CMT 1603, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves; Technology: Selects/Applies/maintains**
1. Build and analyze different read/rite ROM circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Build and analyze different read/write DRAM and SRAM circuits.			SAME	SAME	SAME	
3. Build and analyze different read/write EPROM circuits.			SAME	SAME	SAME	
4. Build and analyze DMA circuits.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (G.10): *Troubleshoot and repair types of microprocessor memory circuits. CMT 1603, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Build and analyze different read/rite ROM circuits.			ACT Level 5 SCANS F1 a	ACT Level 4 SCANS F3		
2. Build and analyze different read/write DRAM and SRAM circuits.			SAME	SAME	SAME	
3. Build and analyze different read/write EPROM circuits.			SAME	SAME	SAME	
4. Build and analyze DMA circuits.			SAME	SAME	SAME	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (G.12): *Fabricate and demonstrate microprocessor machine code and instruction sets. CMT 1603, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Using DEBUG/MASM design, and write machine language programs on MC6800 microprocessor. 2. Using DEBUG/MASM design, and write machine language programs on 8088 microprocessor.		1. Microcomputer 2. Microprocessor trainer	ACT Level 5 SCANS F1 a SAME (Listening EIF 063; Speaking EIF 023,027) Writing EIF 062)	ACT Level 4 SCANS F3 SAME (EIF 066,067,069 072,073,074 075,076,084 090,)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME (EIF 043,EIF 044 EIF 047,EIF 050)	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; Interpersonal: **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/ corrects performance; improves;** Technology: **Selects/Applies/maintains**

*(Build the product/device/circuit and show that it performs as expected.)

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Occupation: Electronic Technician
Duty Area/Function:

Task Analysis Worksheet

EIF SKILL STANDARD (G.13): *__Troubleshoot and repair microprocessor machine code and instruction sets__ CMT 1603, Unit 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills						
Tasks: 1. Using DEBUG/MASM design, write and debug machine language programs on MC6800 microprocessor.		1. Microcomputer 2. Microprocessor trainer	ACT Level 5 SCANS F1-d	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**__Resources__: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **__Interpersonal:__** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **__Information__**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **__Systems__: understands systems; monitors/ corrects performance; improves;** **__Technology:__** **Selects/Applies/maintains**
2. Using DEBUG/MASM design, write and debug machine language programs on 8088 microprocessor.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,069 072,073,074 075,076,084 090;	(EIF 043,EIF 044 EIF 047,EIF 050)	

*(Use a logical process to find the fault(s) in a product/device/circuit, replace and/or repair the defect and demonstrate corrected operation.)

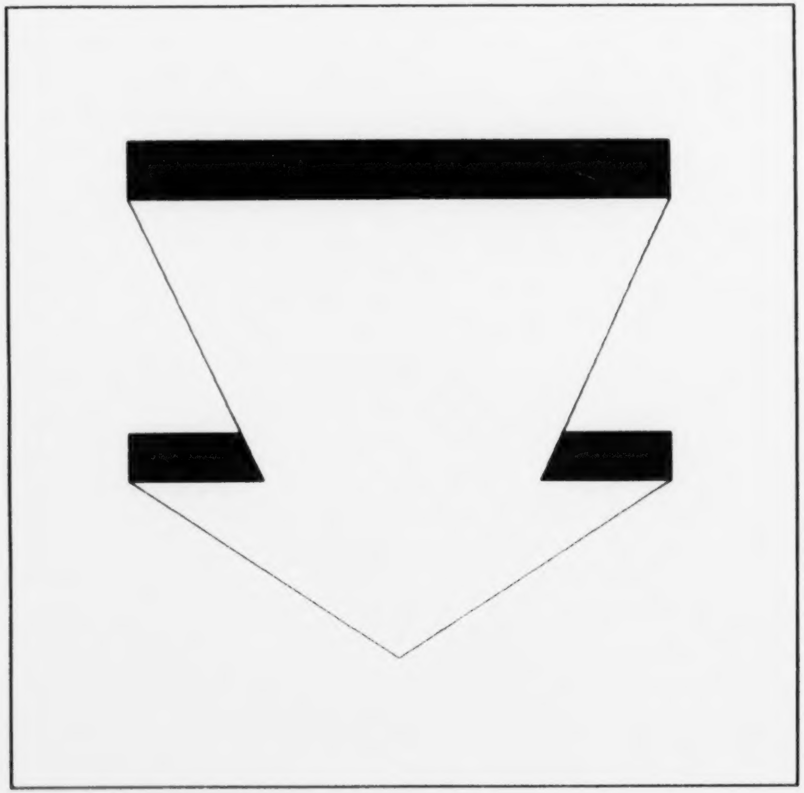
TABLE G

TASK ANALYSIS CROSSWALK

COGNITIVE

352

351



GENERAL

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.01): *Demonstrate an understanding of proper safety techniques for all types of circuits and components(D.C.circuits, A.C. circuits, Audio systems, Analog circuits, Digital circuits, discrete solid state circuits, microprocessors) and apply proper OSHA standards. EEC 1211

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5	**Resources: Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands
1. To be cognizant of the employer and employee rights.			ACT Level 4 SCANS: F1 b	ACT Level 4 SCANS F3 a, F4 c	SCANS: Thinking Skills: All	
2. Understand the major provisions of Federal and State relationships as provided in industrial safety.			SAME	SAME	Personal Qualities: All	
3. Define the psychological factors such as motivation, emotion, frustration, conflict and attitude in relation to safety.			SAME	SAME	SAME	
4. To be able to select, demonstrate and use personal protection equipment.			SAME			
5. Practice personal protection for the prevention of common injuries during material handling.			SAME			
6. Perform electrical safety in the installation, maintenance and training in the use of electrical equipment.			SAME			
7. Develop safety skills in the use of machines and machine tools.			SAME			
8. Identify color coding, ventilating, heating, air conditioning and lighting requirements in the industrial environment.			SAME			
9. To determine the safety requirements in a work cell environment.			SAME			

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)
(Also: Dept. of Army: TRADOC 351 13)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.02): *Demonstrate an understanding of proper troubleshooting techniques. (A.02) BET 314, Unit 5,4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Specifications of: 1. Assembly component level 2. Board level 3. Component level Tasks: 1. Interpret a. diagnostic flowcharts b. troubleshooting charts c. schematics d. manufacturing upgrade 2. Identify a. symptoms b. appropriate procedures c. test requirements d. test equipment needs e. manual specifications			ACT Level 5 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.03): *Demonstrate an understanding of basic assembly skills using hand and power tools. ELT 105, Unit T04 thru T08

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology:** Chooses, understands
1. Use sheet metal equipment to safely construct a chassis.			ACT Level 5 SCANS F1 b	ACT Level 6 SCANS F3 F4	Thinking Skills: All Personal Qualities: All	
2. Build a power supply			SAME	SAME	SAME	
3. Name and identify common electronic assembly tools and machines.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.04): *Demonstrate an understanding of acceptable soldering/desoldering techniques, including through-hole and surface mount devices.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Define a series circuit		DMM, Handheld Calculator (TI 35 or 36 or equiv.) Proto Board Resistors as required	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology:** Chooses, understands
2. Calculate total resistance, total current and the polarity of the IR drops in series circuits.			SAME	SAME	SAME	
3. Describe the difference between a voltage rise and a voltage drop, and use of ground as a reference point.		DC Power Supply	SAME	SAME	SAME	
4. Analyze the use of voltage dividers or attenuators to provide several different voltages from one source.		Hook up wire	SAME	SAME	SAME	
5. List the power distribution rules for series circuits.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.05): *Demonstrate an understanding of proper solderless connections. ELT 105, Unit 4, T05

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies List resources, inform ation, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Build a power supply			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.08): *Demonstrate an understanding of use of data books and cross reference/technical manuals to specify and requisition electronic components. ELT 105, Unit 4, T05

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies List resources, inform ation, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: Build a power supply			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time**: Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems:** understands systems; **Technology:** Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.07): "Demonstrate an understanding of the interpretation and creation of electronic schematics and technical drawings. ELT 105, Unit 4, T05

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: Built a power supply: 1. Interpret diagnostic flowcharts 2. Interpret troubleshooting charts 3. Interpret schematics a. Identify symbols b. Draw/label a schematic of a circuit board c. Trace a signal/schematic d. Identify system blocks from schematic e. Construct/assemble equipment 4. Diagrams a. one line b. loop sheets c. ladder d. logic e. piping f. instrument g. multipage system 5. Blueprints a. Read/transfer measurements b. Describe application of auxiliary/revolutions/sectional views c. Interpret mechanical/electronic production 6. Interpret spreadsheets			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.08): *Demonstrate an understanding of recording of data, design curves and graphs. EEC 1004, 1,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, inter personal and systems competencies/skills required)
	Occupational Theory					
Tasks: Ristance: circular wire, wire tables, metric units, temperature effects Types of resistors (linear, non-linear)			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.09): *Demonstrate an understanding of color codes and other component descriptors. EEC 1004, Unit 2,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: A. Select proper resistors for specific application using color code and wattage rating. B. Determine the value of tolerance of a resistor using color code. C. Determine whether wire wound or carbon resistors are appropriate for a specific application. D. Recognize the characteristics of non linear resistors. E. Manipulate equations and solve problems associated with conductance and resistor tolerance values			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

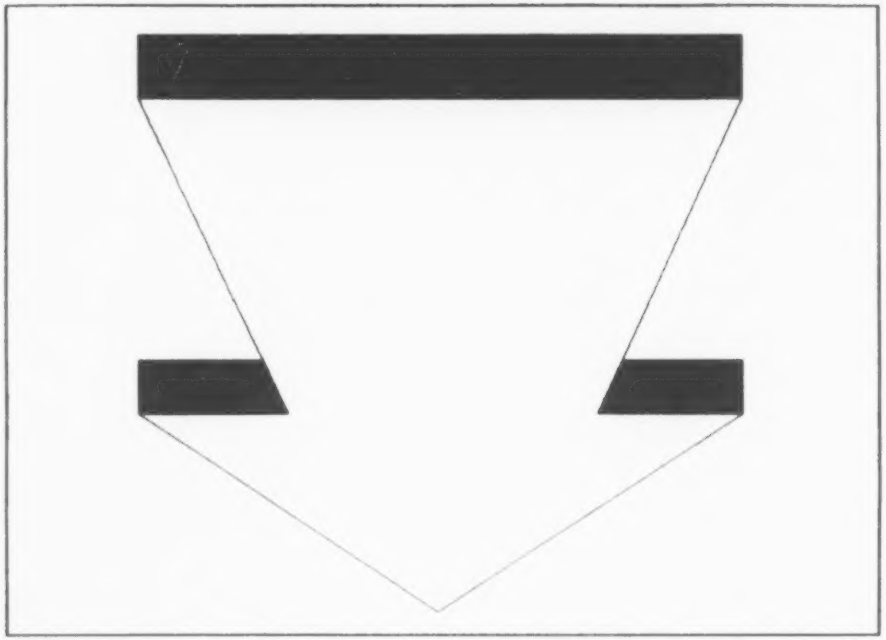
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (A.10): *Demonstrate an understanding of site electrical and environmental survey.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: This area of "site electrical and environmental survey" is a subject onto itself. Depending on the depth of study that is required by industry, we can create a new course or include general information on an existing course.						

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)



DC CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.01): *Demonstrate an understanding of the relationship of electricity to the nature of matter. (Page 1 of 1)(EEC 1004,Unit 1)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, inter personal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						**Resources: Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology:** Chooses, understands
1. Analyze the nature of electricity.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Reasoning Level 4 SCANS: Thinking Skills: All Personal Qualities: All	
2. Explain current flow (conventional and electron).			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Same as 1	
3. Differentiate between voltage and current			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Same as 1	
4. Explain what causes current to move through a conductor.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Same as 1	
5. Manipulate equations and make calculations involving charged bodies, current and voltage.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Same as 1	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.02): *Demonstrate an understanding of sources of electricity (DC & AC). 1102,1004,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Analyze functions/parts of batteries			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3-a	ACT Reasoning Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology:** Chooses, understands
2. Generate electricity with magnetism and understand: a. Natural/manmade magnets (permanent/temporary) b. Magnetic domains/magnetic fields c. Relationship between electrical current and magnetism and solenoid concentration of magnetic field d. Relationship between magnetomotive force, magnetic flux, flux density, field intensity and permeability e. Analyze the B-H curves f. Analyze different losses in electromagnetic circuits			ACT Level 4 SCANS F1-b	ACT Level 4 SCANS F3-a, F4-c	ACT Level 4 SCANS: Same as 1.	
3. Generate electricity with pressure			SAME	ACT Level 5 SCANS F3-a,b; F4-b,c	ACT Level 4 Same as SCANS 1.	
4. Generate electricity with heat			SAME	ACT Level 4 SCANS F3-a, F4-c	SAME	
5. Generate electricity with light			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.03): *Demonstrate an understanding of principles and operation of electrochemical supplies. 1104,1004,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: Explain/identify: 1. Battery 2. Voltaic cells 3. Carbon zinc cell 4. Alkaline cell 5. Summary of dry cells 6. Lithium cell 7. Lead Acid cell 8. Secondary cells 9. Series/parallel cells 10.Internal Resistance/generator 11.Constant voltage/Constant Current sources			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.04): *Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, power and energy in D.C. (EEC 1004, Unit 5)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Define a series circuit.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 a,b; F4 a,c	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: understands systems; **Technology**: Chooses, understands
2. Calculate total resistance, total Current and the polarity of the IR drops in series circuits.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 a,b; F4 a,c	SAME as 1.	
3. Describe the difference between a voltage rise and a voltage drop, and the use of grund as a reference point.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	SAME as 1.	
4. Analyze the use of voltage dividers or attenuators to provide several different voltages from one source.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	SAME as 1.	
5. List the power distribution rules for series circuits.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	SAME as 1.	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.05): *__Demonstrate an understanding of measurement of resistance of conductors and insulators and the computation of conductance.__ EEC 1004, Unit 9

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
__Tasks__:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	__**Resources:**__ **Time**: Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; __**Interpersonal:**__ **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; __**Information**__: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; __**Systems:**__ understands systems; __**Technology:**__ Chooses, understands
1. Explore the relationship between the diameter of a conductor and its specific resistance.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c		
2. Describe the relationship between wire size (diameter) and wire gauge (AWG).			SAME	SAME	SAME	
3. Differentiate between a good insulator and a good conductor.			SAME	SAME	SAME	
4. Describe electrical conduction in gasses, liquids and plasma.			SAME	SAME	SAME	
5. Explore the use of switches and safety devices in electrical circuits.			SAME	SAME	SAME	
6. Make calculations of circular mils and of resistance.			SAME			

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.08): *Demonstrate an understanding of Ohms Law to series, parallel and series parallel circuits EEC 1004, Unit 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal & systems skills/ competencies required)
	Occupational Theory					
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communi-cates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/Applies**
1. Calculate the current in a series circuit given resistance and applied voltage.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 a,b; F4 a,c	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Explain the relationship between resistance, current flow and voltage drops in an electric circuit.			SAME	SAME	SAME	
3. Calculate the amount of resistance necessary to drop a voltage to a desired level.			SAME	SAME	SAME	
4. Manipulate equations and solve problems using Ohm's law.			SAME	SAME	SAME	
5. Determine and use the proper prefixes associated with electronic terms (Powers of ten expressed in units of 3).			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.07): *Demonstrate an understanding of magnetic properties of circuits and devices. EEC 1004, Unit 12

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal & systems skills/ competencies required)**
	Occupational Theory					
Tasks: 1. Differentiate between natural and artificial (manmade) magnets and divide them further into permanent and temporary types.			ACT Level 4 SCANS F1-b	Act Level 5 SCANS F3-a, F4-c	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/ Applies**
2. Explain magnetic domains and how they affect magnetic field to include polarity and field direction.			SAME	SAME	SAME	
3. Describe the relationship between electrical current and magnetism and solenoid concentration of a magnetic field.			SAME	ACT Level 6 SCANS F#-a,b; F4-a,c	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
4. Describe the relationship between magnetomotive force, magnetic flux, flux density, field intensity and permeability.			SAME	SAME	SAME	
5. Analyze the B-H curves and the different losses encountered in electromagnetic circuits.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.08): *Demonstrate an understanding of the physical, electrical characteristics of capacitors and inductors. EEC 1004,5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems: understands systems; monitors/corrects performance; improves; Technology:** Selects/Applies
1. Explain the principles of energy storage in an electrostatic field and charging and discharging action of a capacitor.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	
2. List the unit of measure for and the physical factors affecting capacitance (dielectric constant, area of plates, etc).			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Classify the different types of capacitors, losses encountered and voltage ratings.			SAME	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: SAME	
4. Explain the capacitor coding system and the relationship between frequency and capacitance characteristics.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.09): *Demonstrate an understanding of the maximum power transfer theory. EEC 1004, Unit 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, inter personal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Identify a series circuit.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal**: **Team**: Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/Applies**
2. Calculate total resistance, total current and the polarity of the IR drops in series circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Explain the difference between a voltage rise and a voltage drop, and the use of ground as a reference point.			SAME	SAME	SAME	
4. Analyze the use of voltage dividers or alternators to provide several different voltages from one source.			SAME	SAME	SAME	
5. List the power distribution rules for series circuits.			SAME	SAME	SAME	
6. Analyze the effects of internal resistance on maximum power transfer from source to load.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.10): *Understand principles and operations of DC series circuits. EEC 1004, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, infor mation, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**; communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computers to process information; **Systems: understands systems; monitors/corrects performance; improves** **Technology:** Selects/Applies
1. Explain a series circuit.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 a, F4 c	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	
2. Calculate total resistance, total current and the polarity of the IR drops in series circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Explain the difference between a voltage rise and a voltage drop, and the use of ground as a reference point.			SAME	SAME	SAME	
4. Analyze the use of voltage dividers or alternators to provide several different voltages from one source.			SAME	SAME	SAME	
5. List the power distribution rules for series circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.13): *Understand principles and operations of DC parallel circuits. EEC 1004, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Define/explain a parallel circuit.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies**
2. Calculate total current in parallel circuits.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Calculate total resistance in parallel circuits			SAME	SAME	SAME	
4. Analyze power distribution in parallel circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.16): *Understand the principles and operations of DC series-parallel and bridge circuits. EEC 1004, UNIT 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces;responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology: Chooses, understands**
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Analyze loaded voltage dividers and bridge circuits.			SAME	SAME	SAME	

*(Build the product/device/circuit and show that it performs as expected.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

(B.19): *Understand principles and operations of DC voltage divider circuits (Loaded and Unloaded). EEC 1004, UNIT 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology: Chooses, understands**
1. Identify a series parallel arrangement of components.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Simplify components into a single equivalent resistance.			SAME	SAME	SAME	
3. Analyze a series parallel circuit			SAME	SAME	SAME	
4. Make calculations to determine total resistance.			SAME	SAME	SAME	
5. Make calculations to determine voltage and current distribution.			SAME	SAME	SAME	
6. Analyze loaded voltage dividers and bridge circuits.						

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

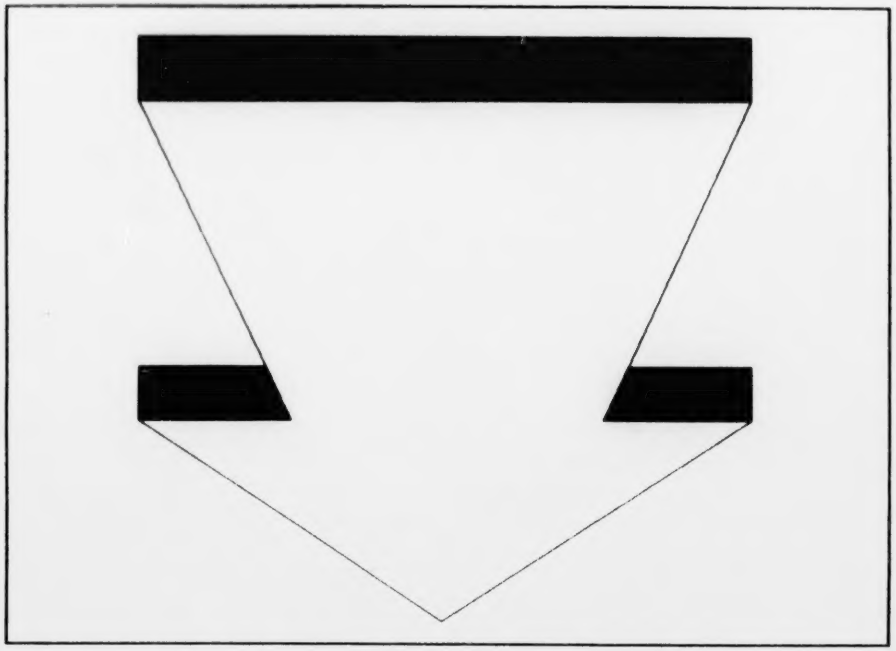
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD (B.22): *Understand principles and operations of DC RC and RL circuits.(B.22)EEC 1004, UNIT 14

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal & systems competencies/skills required)
	Occupational Theory					
Tasks: A. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal**:**Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/Applies/maintains**
A. Calculate charge/discharge times for RC circuits.			SAME	SAME	SAME	
1. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
2. Graph the different charging times based on time constants.			SAME	SAME	SAME	
3. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
4. Calculate time constants for RL circuits.			SAME	SAME	SAME	
5. Discuss the voltage transients produced in RL circuits.			SAME	SAME	SAME	
6. Analyze the universal time constant curve.			SAME	SAME	SAME	
7. Explain the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME		
E. Document the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)



AC CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.01): *Demonstrate an understanding of the properties of an AC signal. EEC 1104, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	Competencies (List resources, information, interpersonal & systems competencies/skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains**
1. Analyze the basic principles of AC generation.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Define a cycle of AC in terms of alternations, degrees, and radians.			SAME	SAME	SAME	
3. Consider AC from the aspects of frequency, angular velocity, period, and wavelength.			SAME	SAME	SAME	
4. Recognize the difference between AC and DC symbols.			SAME	SAME	SAME	
5. Determine to peak to peak, peak, average and effective (RMS) values of sine wave voltages.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.02): *Demonstrate an understanding of the principles of operation and characteristics of sinusoidal and non sinusoidal wave forms. EEC 1104, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	Competencies (List resources, information, interpersonal & systems competencies/skills required)
	Occupational Theory					
Tasks:						Resources: Time: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; Material/ Facility: Acquires, stores, uses materials efficiently; Interpersonal: Team: Participates as team; teaches others; Leadership: communicates ideas to justify position, persuades/ convinces; responsibly challenges; Works with Diversity: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains
1. Analyze the basic principles of AC generation.			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Define a cycle of AC in terms of alternations, degrees, and radians.			SAME	SAME	SAME	
3. Consider AC from the aspects of frequency, angular velocity, period, and wavelength.			SAME	SAME	SAME	
4. Recognize the difference between AC and DC symbols.			SAME	SAME	SAME	
5. Determine to peak to peak, peak, average and effective (RMS) values of sine wave voltages.			SAME	SAME	SAME	
6. Analyze vector and phaser values as they apply to AC circuits.			SAME	SAME	SAME	
7. Evaluate the applications of polyphase voltages,			SAME	SAME	SAME	
8. Differentiate between the various types of AC voltages (nonsinusoidal).			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.03): *Demonstrate an understanding of basic motor/generator theory and operation. EEC 1104,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Knowledge of Basic Components of generators/motors a. Field windings b. Armature c. Brushes d. Commutator (D.C.) c. Sup Rings (A.C.) 2. Application of Lenz's and Faraday's Laws to electromagnetic induction 3. Knowledge of the relationship between magnetism & current flow in a conductor		DMM, Galvano meter; Perman ENNT magnets (Horseshoe & Bar)	ACT Level 4 SCANS F1 b	ACT Level 5 SCANS Level F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology: Understands, selects**

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.04): *Demonstrate an understanding of measurement of power in AC and DC circuits. EEC 1104, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology:** Understands, selects
1. Analyze the basic principles of AC generation.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS Level F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Define a cycle of AC in terms of alternations, degrees, and radians.			SAME	SAME	SAME	
4. Consider AC from the aspects of frequency, angular velocity, period, and wavelength.			SAME	SAME	SAME	
4. Determine to peak to peak, peak, average and effective (RMS) values of sine wave voltages.			SAME	SAME	SAME	
Unit 3 5. Differentiate between true and apparent power and the power factor in AC circuits.			SAME	SAME	SAME	
5. Recognize the differences between AC and DC meters and the application of Wattmeters.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.05): *Demonstrate an understanding of the principle and operations of various power conditioning: (isolation transformers, surge suppressors, uninterruptable power systems) EEC 1104 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Identify the different types of transformers.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology:** understands, chooses
2. Analyze transformer principles.			SAME	SAME	SAME	
3. Evaluate the application of Autotransformers, the requirements for Isolation transformers and how the use of one dictates the use of the other.			SAME	SAME	SAME	
4. Explain the Transformer Connections for Three Phase circuits.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.08): *Demonstrate an understanding of the principle and operation of safety grounding systems: (lighting arresters, ground fault interrupters, etc.). EEC 1104, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: Grounding: A. Connects one side of AC series to earth for safety. (1) Against shock (2) Against excessive high Voltage due to lightening. B. Lightening Arrestor (1) Spark Gap devices installed by power companies to safety discharge strikes. C. Ground Fault Intemplers (GFI's) Senses excessive current (usually 5 amp or greater) and opens circuit as a protection against shock.			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 4 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor **Technology:** understands, chooses

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.07): *Understand principles and operations of AC capacitive circuits. EEC 1104, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems;** monitor
1. Calculate capacitive reactance.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Calculate total reactances for series circuits.			SAME	SAME	SAME	
3. Calculate total reactances for parallel circuits.			SAME	SAME	SAME	
4. Graph the relationship between capacitive reactance and frequency.			SAME	SAME	SAME	
5. Determine the phase relationship between voltage and current in a capacitive circuit.			SAME	SAME	SAME	
6. Evaluate power in a purely capacitive circuit.			SAME	SAME	SAME	
7. Manipulate equations and solve problems associated with reactive circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.10): *Understand principles and operations of AC inductive circuits. EEC 1104, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Construct inductive circuits			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; improves;** **Technology:** **Selects/Applies**/maintains/ troubleshoots
2. Measure currents.			SAME	SAME	SAME	
3. Measure voltage.			SAME	SAME	SAME	
4. Measure reactance.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.13): *Understand principles and operations of AC inductive circuits. EEC 1104, UNIT 7

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; improves;** **Technology: Selects/Applies/**main tains/troubleshoots
1. Explain principles of mutual inductance			ACT Level 4 SCANS F1-b	ACT Level 6 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Explain coefficient of coupling			SAME	SAME	SAME	
3. Calculate turns ratio for current			SAME	SAME	SAME	
4. Calculate turns ratio for voltage			SAME	SAME	SAME	
5. Calculate turns ratio for impedance			SAME	SAME	SAME	
6. Determine losses (core, current)			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.16): *Understand principles and operations of AC differentiator and integrator circuits (determine RC and RL time constants) EEC 1004, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Calculate time constants for RC circuits.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**
2. Calculate charge/discharge times for RC circuits.			SAME	SAME	SAME	
3. Calculate the effects of R and C on charging time.			SAME	SAME	SAME	
4. Graph the different charging times based on time constants.			SAME	SAME	SAME	
5. Graph the different charging times based on voltage amplitude.			SAME	SAME	SAME	
6. Calculate time constants for RL circuits.			SAME	SAME	SAME	
7. Explain the voltage transients produced in RL circuits.			SAME	SAME	SAME	
8. Analyze the universal time constant curve.			SAME	SAME	SAME	
9. Explain the universal time constant curve application to the study of RC and RL time constant circuits.			SAME	SAME		
10. Document the effects of long and short time constants on square wave voltages.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.19): *Understand principles and operations of AC series and parallel resonant circuits EEC 1104, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 4 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team**: Participates as team; **teaches others;** **Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/ maintains**
1. Define Resonance.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	Thinking Skills: All Personal Qualities: All	
2. Analyze Series Resonant Circuits including the basic characteristics.			SAME	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
3. Evaluate the Q of a resonant circuit and its effects on the circuit including how it may be changed.			SAME	SAME	SAME	
4. Evaluate the Q effects on circuit bandwidth.			SAME	SAME	SAME	
5. Explore the concepts of an Ideal Parallel Resonant Circuit.			SAME	SAME	SAME	
6. Compare the concepts of an Ideal Parallel Resonant Circuit to a Practical Parallel Resonant Circuit.			SAME	SAME	SAME	
7. Analyze Parallel Resonant Circuits.			SAME	SAME	SAME	
8. Compare Parallel Resonant Circuits with Series Resonant Circuits.			SAME	SAME	SAME	
9. Analyze the effects of dampening a parallel resonant circuit including how it affects the Q and bandwidth of the circuit.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.22): *Understand principles and operations of AC RC, RL, and RLC circuits EEC 1104, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, inter personal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Perform vector algebra addition, subtraction, multiplication and division and solve reactive circuits using these procedures.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
2. Perform rectangular to Polar and Polar to Rectangular conversion in the solution of reactive circuits.			SAME	SAME	ACT Level 5 SCANS: SAME	
3. Compare the different methods for determining impedance (Z) in series and parallel circuits and methods for reducing these circuits to a simple series equivalent circuit.			SAME	SAME	SAME SAME	
4. Solve for impedance (Z) of parallel reactive circuits using conductance, susceptance and admittance (minimum coverage).			SAME	SAME	SAME	
5. Solve for impedance in complex series parallel AC networks.			SAME	SAME	SAME	
6. Apply Thevenin's and Norton's Theorems to the solutions of AC circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.25): *Understand principles and operations of AC frequency selective filter circuits. EEC 1104, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:						**Resources:** **Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information:** Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
1. Recognize High Pass filters by component types and placement, their application and their frequency response curves.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Recognize Low Pass filters by component types and placement, their application and their frequency response curves.			SAME	SAME	SAME	
3. Recognize Bandpass filters by component types and placement, their application and their frequency response curves.			SAME	SAME	SAME	
4. Analyze Constant-K and m-Derived filters and their equipment.			SAME	SAME	SAME	
5. Solve for component values in filter circuits as appropriate.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.28): ***Understand principles and operations of AC polyphase circuits.** ELT 212, UNIT 6

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)**
	Occupational Theory					
Tasks: Definitions: A. Single Phase 120v B. Two Phase 240v C. Three Phase 208v (Edison System) Color Coding A. Three wire 120v - 240v residential B. Three Phase 208v - Service Local Electrical Codes *National Electrical Codes (Polyphase electrical services **are not** normally taught as a part of course in this area except as an introductory part. What goes on behind the 120/240/208v outlet is a course all by itself)			ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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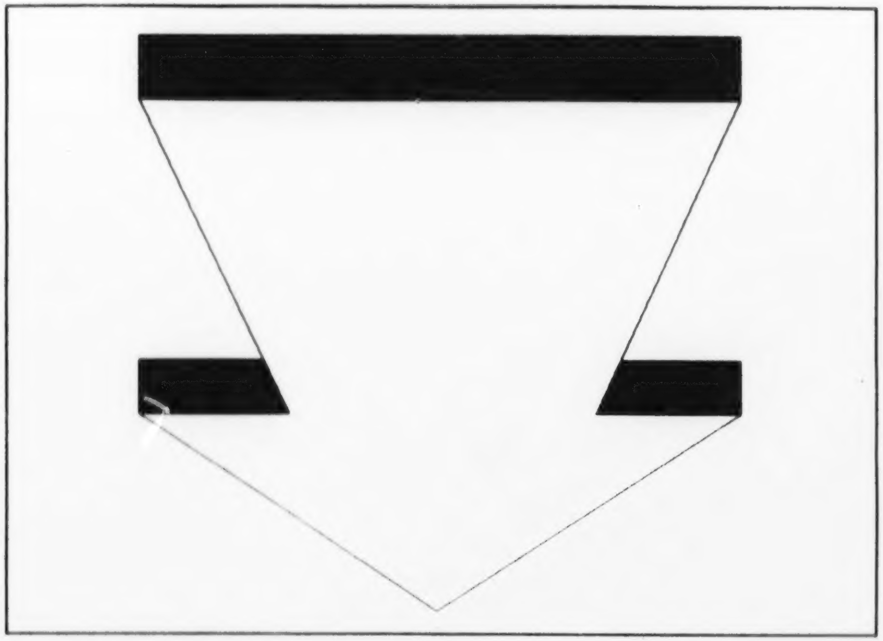
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (C.31): *Understand principles and operations of AC phase locked loop circuits. ELT 212, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: This is beyond the scope of currently taught communications courses at the community college level. It is usually taught as part of radar and/or robotics courses.						

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).



DISCRETE SOLID STATE DEVICES

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.01): *Demonstrate an understanding of the properties of semiconductor materials. EEC 1404, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/ Applies/maintains**
1. Explain the relationship between valence band electrons & conductivity.			ACT Level 4 SCANS F1-b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Describe covalent bonding			SAME	SAME	SAME	
3. Explain the purpose of doping			SAME	SAME	SAME	
4. List the most commonly used semiconductor materials			SAME	SAME	SAME	
5. Differentiate between N type & P type materials			SAME	SAME	SAME	
6. Discuss the relationship between temperature & conduction.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.02): *Demonstrate an understanding of PN junctions. EEC 1404, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership:** communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
1. Discuss the formation of the deplectin layer around a PN junction			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Recognize forward bias & its effects on depletion layer width & junction resistance & current.			SAME	SAME	SAME	
3. Recognize reverse bias & its effects on depletion layer width & junction resistance & current.			SAME	SAME	SAME	
4. Compare & contrast the three diode models (approximately)			SAME	SAME	SAME	
5. List the main parameters & electrical characteristics of the PN junction diode as found on device specifications sheets.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.03): *Demonstrate an understanding of bipolar transistors. (Page 1 of 2) EEC 1404, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Explain basic bipolar transistor theory & operation 2. Recognize & draw the schematic symbols for NPN & the PNP transistors. 3. Calculate the three transistor currents & describe how they interrelate. 4. State the three operating regions of the transistor. 5. Describe the characteristics of a saturated transistor. 6. Describe the characteristics of a transistor that is in cutoff. 7. Compare the three basis transistor configurations. 8. Explain the operation of a transistor using its collector curves. 9. Describe the effects temperature has on a transistor's beta and DC collector current.			ACT Level 5 SCANS F1-d SAME SAME SAME SAME (EIF 056,057,058,059, 060) (Listening 5 EIF 063; Writing 4 EIF 062)	ACT Level 6 SCANS F3 & F4 SAME SAME SAME SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	ACT Level 5 SCANS: SAME SAME SAME SAME SAME	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/ Applies/maintains**

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.04): *Demonstrate an understanding of field effect transistors (FET's/MOS-FET's) (Page 1 of 4) EEC 1503, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08, 014, 015, 022				**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires,stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
1. Describe the physical construction, the schematic symbols and the supply voltage polarities of the N channel junction FET and the P channel junction FET.			ACT Level 5 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Explain the relationship between gate source voltage, channel width, drain current, and drain source voltage.			SAME	SAME	SAME	
3. Interpret a set of drain curves and identify the OHMIC Pinch Off and the constant current regions.			SAME	SAME	SAME	
4. List the most important parameters of JFETs & state their significance.			SAME	SAME	SAME	
5. Define transconductance & plot a transconductance curve for a given JFET.			SAME	SAME	SAME	
6. Compare & contrast gate bias, self bias, & voltage divider bias.			SAME	SAME	SAME	
7. Explain the common square amplifier response to an AC input voltage.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.04): "Demonstrate an understanding of field effect transistors (FET's/MOS FET's) (Page 2 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08, 014, 015, 022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
8. List the gain & impedance features of the common-gate amplifier & of the common-drain amplifier.			ACT Level 5 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Describe the physical construction & operating modes of a DE MOSFET.			SAME	SAME	SAME	
10. Compare the depletion-mode operation of a DE-MOSFET with its operation in the enhancement mode.			SAME	SAME	SAME	
11. Plot the transconductance curve(s) for a DE-MOSFET.			SAME	SAME	SAME	
12. Describe the physical construction & operating principles of the E-MOSFET.(Unit 2)			SAME	SAME	SAME	
13. Calculate the GM constant "k" for a given MOSFET & the value of drain current for a given value of gate-source.			SAME	SAME	SAME	
14. Describe the biasing circuits most commonly used for D MOS & E MOS device circuits.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.04): *Demonstrate an understanding of field effect transistors (FET's/MOS-FET's) (Page 3 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08, 014, 015, 022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/ Applies/maintains**
15. Discuss the unique features & applications of the dual gate MOSFET, VMOS, LDMOS & the CMOS inverter.			ACT Level 5 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
16. Compare the transconductance curves & the drain curves of the JFET D-MOSFET, and E-MOSFET.			SAME	SAME	SAME	
17. List applications for D-MOSFET & E-MOSFET.			SAME	SAME	SAME	
18. Describe, construct, and analyze the BJT switch.(Unit 4)			SAME	SAME	SAME	
19. Describe & analyze the operation of the JFET switch & the MOSFET switch.			SAME	SAME	SAME	
20. Describe and calculate phase width, duty cycle & propagation delay.			SAME	SAME	SAME	
21. Measure delay time, rise time, storage time, & fall time with an oscilloscope.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.04): *Demonstrate an understanding of field effect transistors (FET's/MOS FET's) (Page 4 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08, 014, 015, 022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/ Applies/maintains**
22. Compare the free-running, one-shot, and bistable multivibrators.			ACT Level 5 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
23. Describe the 555 timer, its internal operation & its primary applications.			SAME	SAME	SAME	
24. Describe the operation of the monostable (one shot) multivibrator.			SAME	SAME	SAME	
25. Describe the operation of the astable (free-running) multivibrator.			SAME	SAME	SAME	
26. Construct a free-running multivibrator circuit and demonstrate the effects of external component changes on the output signal.			SAME	SAME	SAME	
27. Test a JFET functionally with an ohmmeter.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.05): *Demonstrate an understanding of special diodes and transistors. (Page 1 of 4)EEC 1404, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
1. Identify the schematic symbols & proper lead placement for the PN diode, the zener diode, and the LED.			ACT Level 5 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Discuss the operating characteristics of the Zener diode & LED.			SAME	SAME	SAME	
3. List the main parameters & electrical characteristics of the PN diode, the Zener diode, and LED.			SAME	SAME	SAME	
4. Discuss the use of LED as level indicators.(Unit 3)			SAME	SAME	SAME	
5. Explain the operation of the 7 segment display (common anode & common cathode).			SAME	SAME	SAME	
6. List the main parameters & electrical characteristics of the Lener & LED as found on device specification sheets.(Unit 4)			SAME	SAME	SAME	
7. Define & calculate the line and load regulation rating of a given voltage regulator.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.05): "Demonstrate an understanding of special diodes and transistors. (Page 2 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,03,014,015,022				**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems**: **understands systems; monitors/corrects performance; improves;** **Technology**: **Selects/ Applies/maintains**
8. Define & explain the single regulation rating of a given voltage regulator.(Unit 8)			ACT Level 5 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Compare the series & shunt regulators.			SAME	SAME	SAME	
10. Explain why the series regulator is preferred over the shunt regulator.			SAME	SAME	SAME	
11. Explain the operation of the IC voltage regulator.			SAME	SAME	SAME	
12. List & define the major parameters & ratings of an IC voltage regulator.			SAME	SAME	SAME	
13. Calculate the maximum allow able input voltage & the value of regulated output voltage for an adjustable IC regulator.			SAME	SAME	SAME	
14. Construct & evaluate discrete voltage regulator circuits & IC regulator circuits.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.05): *Demonstrate an understanding of special diodes and transistors. (Page 3 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
15. Describe the construction & operation of an uni junction transistor (UJT).(Unit 5)			ACT Level 5 SCANS F1 d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
16. Define intrinsic standoff ratio & negative resistance.			SAME	SAME	SAME	
17. Construct a UJT relaxation oscillator; perform circuit calculations & compare the waveforms at emitter, base 1 & base 2.			SAME	SAME	SAME	
18. Describe the operating character-istics & applications of a varactor diode.(Unit 6)			SAME	SAME	SAME	
19. Describe the operation of transient suppressors & their usefulness in electronic circuits.			SAME	SAME	SAME	
20. Compare back to back transient suppressors with standard transient suppressors.			SAME	SAME	SAME	
21. Discuss the operation of a constant-current diode & its applications as a series current regulator & a shunt current regulator.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.05): *Demonstrate an understanding of special diodes and transistors. (Page 4 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
22. Describe the operation of the tunnel diode & recognize its I-E characteristic curve.			ACT Level 5 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
23. Describe the operation of a tunnel diode oscillator circuit.			SAME	SAME	SAME	
24. Describe the construction & operation of the Schottky diode.			SAME	SAME	SAME	
25. Describe the construction & operation of PIN diode.			SAME	SAME	SAME	
26. Describe the construction & operation of the step recovery diode.			SAME	SAME	SAME	
27. Identify the schematic symbols of the varactor, transient suppressors, constant current diode, tunnel diode, Schottky diode, & PIN diode.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.08): *Understand principles and operations of diode circuits. (Page 1 of 2) EEC 1404, UNIT 2

Technology		**Tools, Equipment Materials Used**	**Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)**	**Math Skill (List math skills used and level required)**	**Reasoning Skills (List creative, decision and problem solving skills used)**	**SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)**
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/ Applies/maintains**
1. Analyze simple PN diode circuits.			ACT Level 5 SCANS F1-d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Determine the suitability of a given application using specification sheets or selector guides.			SAME	SAME	SAME	
3. Explain the purpose of a power supply & list circuits involved.(Unit 3)			SAME	SAME	SAME	
4. Explain operation of: half wave rectifier, full wave rectifier, & bridge rectifier.			SAME	SAME	SAME	
5. Calculate peak & DC average output voltage & current for any rectifier circuit.			SAME	SAME	SAME	
6. Discuss the effects that filtering has on a rectifier's output voltage.			SAME	SAME	SAME	
7. Determine the Peak Inverse Voltage (PIV) for a diode in any rectifier circuit.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.08): *Understand principles and operations of diode circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. Calculate current & voltage values for a filtered rectifier circuit.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Describe the basic operations of clippers, clampers, & voltage multipliers & the purposes served by each.			SAME	SAME	SAME	
10. Discuss the use of clippers for transient protection.			SAME	SAME	SAME	
11. Describe the operation of an AM detector diode circuit.			SAME	SAME	SAME	
12. Draw circuit diagrams & their respective input & output waveforms for half wave rectifiers, full wave rectifiers, filtered rectifiers, clippers & clampers.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.09): *Understand principles and operations of optoelectronic circuits (Gate isolators, Interrupt sensors, infra red sensors, etc.) EEC 1503, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:						**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Explain the operation, parameters & ratings of the photodiode.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Describe the operation of a standard photo transistor & compare it to the Photo Darlington transistor.			SAME	SAME	SAME	
3. Discuss the operation of the photodector & the LASCR.			SAME	SAME	SAME	
4. Discuss the construction, operation & applications of optoisolators & optointerrupters.			SAME	SAME	SAME	
5. Explain why wavelength is an important concept in electronics & calculate the wavelength (innanometers) of a signal with a given frequency.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.12): *Understand principles and operations of single stage amplifiers. (Page 1 of 4) EEC 1503, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02, 08, 014, 015, 022				Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; Interpersonal: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** Technology: **Selects/Applies/maintains**
1. State the purpose served by DC biasing circuits.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Plot the DC load line & Q point for a given amplifier.			SAME	SAME	SAME	
3. Recognize base bias and calculate circuit values.			SAME	SAME	SAME	
4. Determine laid point bias & explain Q point shift.			SAME	SAME	SAME	
5. Recognize emitter bias & calculate circuit values.			SAME	SAME	SAME	
6. Recognize voltage divider bias & calculate circuit values.			SAME	SAME	SAME	
7. Describe construction & current characteristics of collector feedback & emitter feedback bias.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.12): *Understand principles and operations of single stage amplifiers. (Page 2 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02, 08, 014, 015, 022				Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. Describe voltage gain, current gain, & power gain of each transistor configuration.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Calculate AC emitter resistance.			SAME	SAME	SAME	
10. Discuss the roles of coupling capacitors & bypass capacitors in amplifiers.			SAME	SAME	SAME	
11. Derive the AC equivalent circuit for any given amplifier.			SAME	SAME	SAME	
12. Calculate voltage gain, output power, & impedances for any given amplifier.			SAME	SAME	SAME	
13. Explain the effects of loading & swamping on amplifier gain & stability.			SAME	SAME	SAME	
14. Perform circuit calculations using H parameters.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.12): *Understand principles and operations of single stage amplifiers.* (Page 3 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02, 08, 014, 015, · 022				**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
15. Identify Class A, AB, B, & C amplifiers.			ACT Level 5 SCANS F1·d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
16. Compare RC coupled & transformer coupled class A amplifiers.			SAME	SAME	SAME	
17. Calculate amplifier compliance, source power, load power, & efficiency for RC & FMR coupled class A amplifiers.			SAME	SAME	SAME	
18. Describe the operating characteristics of Class B, Class AB complementary & push pull amplifiers.			SAME	SAME	SAME	
19. Calculate load power, source power, and efficiency for two transistor Class B & Class AB amplifiers.			SAME	SAME	SAME	
20. Discuss the relationship between frequency bandwidth & amplifier gain.			SAME	SAME	SAME	
21. Calculate and measure bandwidth.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.12): *Understand principles and operations of single stage amplifiers. (Page 4 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02, 08, 014, 015, 022				**Resources: Time:** Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
22. Draw a bode plot.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
23. Discuss the relationship between the roll off rate & the bandwidth of a tuned amplifier.			SAME	SAME	SAME	
24. Calculate Q, BW, and center frequency.			SAME	SAME	SAME	
25. Describe the circuit operation of a Discrete tuned amplifier.			SAME	SAME	SAME	
26. Discuss the procedures for tuning an amplifier.			SAME	SAME	SAME	
27. Describe the circuit operation of a Class C amplifier.			SAME	SAME	SAME	
28. Compare JFETs and BJTs in terms of construction, operating principles & applications as amplifiers.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.15): *Understand principles and operations of thyristor circuitry (SCR, TRIAC, DIAC, etc.) EEC 1503, UNIT 5

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:						**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Define thyristor; list those most widely used & identify their schematic symbols.			ACT Level 5 SCANS F1 d	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Describe the construction & operation of silicon unilateral switch (SUS) and silicon controlled rectifier (SCR).			SAME	SAME	SAME	
3. List & define the primary parameters & ratings of the SUS & SCR.			SAME	SAME	SAME	
4. Calculate surge current limits for SCR circuit.			SAME	SAME	SAME	
5. Define false triggering in SCR circuits & describe methods used to prevent it.			SAME	SAME	SAME	
6. Describe operation & function of SCR crowbar circuit, SCR phase controller, & SCR motorspeed controller.			SAME	SAME	SAME	
7. Describe construction, operation & applications of the SBS, GTO & SIDAC.			SAME (EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	SAME (EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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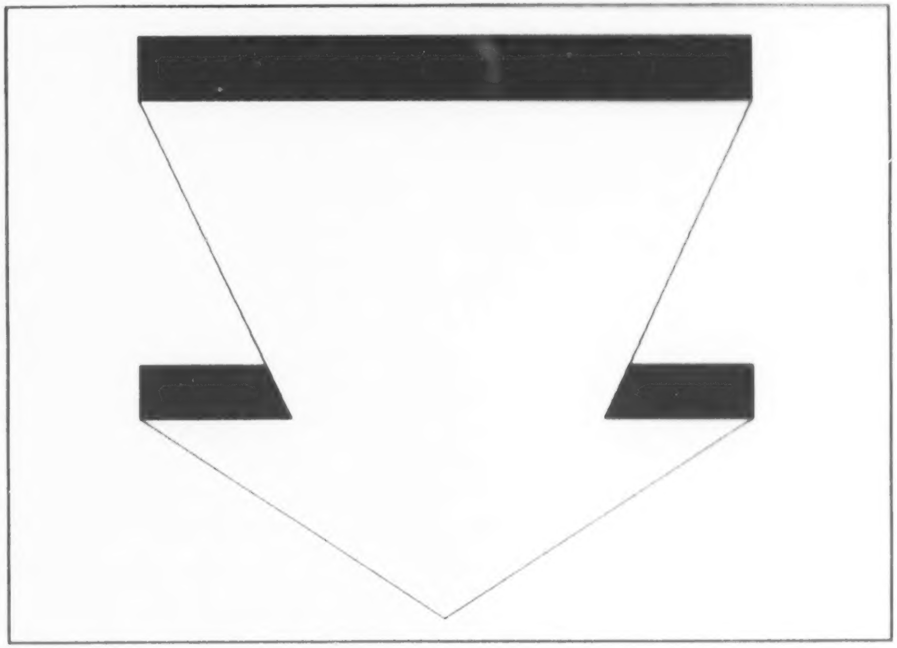

ANALOG CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.01): *Understand principles and operations of multistage amplifiers (Page 1 of 2) ELT 212, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Analyze the frequency spectrum and where the audio range fits into the spectrum.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Components 6. Hook-up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Distinguish between voltage and power amplifiers and the various types of devices used in these circuits.			SAME	SAME	SAME	
3. Differentiate between the different classes of amplifiers (A, AB, B) and the biasing arrangements for each type.			SAME	SAME	SAME	
4. Explain the functions of the transducers (microphones, earphones & loudspeakers) used in audio amplifiers.			SAME	SAME	SAME	
5. Identify the methods of coupling and impedance matching employed in audio amplifiers.			SAME	SAME	SAME	
6. Recognize single ended, push pull & complementary symmetry audio amplifier circuits and their characteristics.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (D.05): ***Demonstrate an understanding of special diodes and transistors.** (Page 4 of 4)**

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		EIF 02,08,014,015,022				**Resources**: **Time** Selects goal relevant activities, ranks goals, allocates time, Prepares & follows schedule, **Material/Facility**: Acquires, stores, uses materials efficiently. **Interpersonal:** **Team**: Participates as team, **teaches others; Leadership** communicates ideas to justify position, persuades/ convinces, responsibly challenges, **Works with Diversity**: works with others, **Information** Acquires, evaluates organizes, maintains, interprets, communicates information, uses computer to process information **Systems: understands systems; monitors/corrects performance, improves;** **Technology: Selects/ Applies/maintains**
22. Describe the operation of the tunnel diode & recognize its I-E characteristic curve.			ACT Level 5 SCANS F1-d	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
23. Describe the operation of a tunnel diode oscillator circuit.			SAME	SAME	SAME	
24. Describe the construction & operation of the Schottky diode.			SAME	SAME	SAME	
25. Describe the construction & operation of PIN diode.			SAME	SAME	SAME	
26. Describe the construction & operation of the step-recovery diode.			SAME	SAME	SAME	
27. Identify the schematic symbols of the varactor, transient suppressors, constant-current diode, tunnel diode, Schottky diode, & PIN diode.			SAME	SAME	SAME	
			(EIF 056,057,058,059, 060)(Listening 5 EIF 063;Writing 4 EIF 062)	(EIF 070,071,072,074, 075,076,077, 078,081, 084,086,087,089)		

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.04): *Understand principles and operations of RF/IF circuits. (Page 1 of 2) ELT 212, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Select the proper RF amplifier for a specific application using the frequency voltage & power requirements.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Define the requirements, advantages & disadvantages of the different biasing arrangements of RF amplifiers.			SAME	SAME	SAME	
3. List the different methods of coupling between RF stages & the advantages, disadvantages & limitations of each.			SAME	SAME	SAME	
4. Recognize single ended, parallel & push pull operations and how to tune the output circuits of each configuration.			SAME	SAME	SAME	
5. Analyze the requirements for & the different methods of neutralizing RF amplifiers.			SAME	SAME	SAME	
6. Identify the characteristics of and requirements for frequency multiplier circuits in RF amplifier applications.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.04): *Understand principles and operations of RF/IF circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 7. Review the method for determining values of L and C for resonant circuits.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. Explain the advantages of grounded grid (base gate) RF amplifiers and Pi network outputs.			SAME	SAME	SAME	
9. Analyze the special characteristics of UHF and VHF amplifiers.			SAME	SAME	SAME	
10. Examine transistor RF amplifiers and Pi network output networks.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.07): *Understand principles and operations of linear power supplies and filters. (Page 1 of 3) EEC 1404, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. A.C. Source 2. DMM 3. Scope 4. Proto Board 5. Diodes & other components 6. Hook up wire				**Resources. Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**
1. Explain the purpose of a power supply & list the circuits involved.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Explain the operation of the half wave rectifier, the full wave rectifier & the bridge rectifier.			SAME	SAME	SAME	
3. Calculate the peak and dc average output voltage and current for any rectifier circuit.			SAME	SAME	SAME	
4. Discuss the effects that filtering has on a rectifier circuit.			SAME	SAME	SAME	
5. Determine the PIV for a diode in any rectifier circuit.			SAME	SAME	SAME	
6. Calculate the current & voltage values for a filtered rectifier circuit.			SAME	SAME	SAME	
7. Explain the operation of a shunt zener regulator & calculate the values of its voltages & currents.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.07): *Understand principles and operations of linear power supplies and filters. (Page 2 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. A.C. Source 2. DMM 3. Scope 4. Proto Board 5. Diodes & other components 6. Hook up wire				**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. State the basic operation of clippers, clampers, & voltage multipliers & the purposes served by each.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Discuss the use of clippers for transient protection.			SAME	SAME	SAME	
10. Describe the operation of an AM diode detector circuit.			SAME	SAME	SAME	
11. Discuss the use of LEDs as level indicators.			SAME	SAME	SAME	
12. Explain the operation of the 7 segment display, the common cathode display and the common anode display.			SAME	SAME	SAME	
13. Recognize clipper, clamper and multiplier circuits.			SAME	SAME	SAME	
14. Draw circuit diagrams & their respective input & output waveforms for half wave, full wave, filtered rectifiers, clippers, and clampers.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.07): *Understand principles and operations of linear power supplies and filters. (Page 3 of 3)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. A.C. Source 2. DMM 3. Scope 4. Proto Board 5. Diodes & other components 6. Hook up wire				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
15. Define & calculate the line regulation rating of a given voltage regulator.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
16. Define & calculate the load regulation rating of a given voltage regulator.			SAME	SAME	SAME	
17. Define & explain the single regulation rating of a given voltage regulator.			SAME	SAME	SAME	
18. Compare & contrast the series regulator & the shunt regulator.			SAME	SAME	SAME	
19. Explain why the series regulator is preferred over the shunt regulator.			SAME	SAME	SAME	
20. Explain the operation of the IC voltage regulator.			SAME	SAME	SAME	
21. List & define the major parameters & ratings of an IC voltage regulator.			SAME	SAME	SAME	
22. Calculate the maximum allowable input voltage & the value of regulated output voltage for an adjustable IC regulator.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.10): *Understand principles and operations of operational amplifier circuits. (Page 1 of 2) ELT 2003, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. The operational amplifier: a. Interpret a typical operational amplifier data sheet;		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Diodes & other components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
b. Measure common operational amplifier parameters;			SAME	SAME	SAME	
c. Identify input & feedback elements & calculate the effects of feedback on the circuit.			SAME	SAME	SAME	
2. Basic linear amplifier circuits: Predict the performances of, & demonstrate an understanding of the operation of the: 1) voltage follower; 2) non inverting amplifier; 3) inverting amplifier; 4) 2 input summing amplifier; 5) difference amplifier.			SAME	SAME	SAME	
3. The differentiator & integrator: Predict the performances of, and demonstrate an understanding of the operation of the: 1) differentiator; 2) integrator.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.10): *Understand principles and operations of operational amplifier circuits. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 4. Non linear signal processing circuits: Predict the performance of, & demonstrate an understanding of the operation of the: 1) non inverting comparator; 2) sine to square wave converter; 3) window comparator; 4) precision half wave & full wave rectifier.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Diodes & other components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
5. Generators: Predict the performance of, & demonstrate an understanding of the operation of the: 1) Wien bridge sine wave oscillator; 2) square wave oscillator; 3) combination square & triangle wave generator.			SAME	SAME	SAME	
6. The Norton Op amp: a. Predict & demonstrate the effect of varying the bias of the Norton op amp; b. Predict the performances of, & demonstrate an understanding of the operation of the Norton op amp circuits: 1) non inverting AC & inverting AC amplifier; 2) voltage controlled oscillator.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.13): *Understand principles and operations of audio power amplifiers. (Page 1 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Analyze the frequency spectrum and where the audio range fits into the spectrum.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule, **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity**: works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Distinguish between voltage and power amplifiers and the various types of devices used in these circuits.			SAME	SAME	SAME	
3. Differentiate between the different classes of amplifiers (A, AB, B) and the biasing arrangements for each type.			SAME	SAME	SAME	
4. Explain the functions of the transducers (microphones, earphones & loudspeakers) used in audio amplifiers.			SAME	SAME	SAME	
5. Identify the methods of coupling and impedance matching employed in audio amplifiers.			SAME	SAME	SAME	
6. Recognize single ended, push pull & complementary symmetry audio amplifier circuits and their characteristics.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.13): *Understand principles and operations of audio power amplifiers. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 7. Analyze the use of inverse feedback for linearity control & the different methods employed in volume & tone control.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Components 6. Hook up wire	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. Measure the effects of some typical transistors, operational amplifiers, and active bandpass filter circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.16): *Understand principles and operations of regulated and switching power supply circuits. EEC 1503, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Describe & analyze the BJT switch.		1. Function Generator 2. DMM 3. Scope 4. Proto Board 5. Parts kit	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Describe & analyze the operation of the JFET switch & the MOSFET switch.			SAME	SAME	SAME	
3. Describe & calculate pulse width, duty cycle & propagation delay.			SAME	SAME	SAME	
4. Compare & contrast the free running multivibrator, the one shot & the bistable multivibrator.			SAME	SAME	SAME	
5. Describe the 555 timer, its internal operation & its primary applications.			SAME	SAME	SAME	
6. Describe the operation of the monostable (one shot) multivibrator.			SAME	SAME	SAME	
7. Describe the operation of the astable (free running) multivibrator.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.19): *Understand principles and operations active filter circuits. EEC 1104, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. Assorted Components 2. DMM 3. Scope 4. Proto Board 5. Parts kit				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. Recognize high pass Filters by component types and placement, their application and their frequency response curves.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Recognize Low Pass Filters by component types and placement, their application and their frequency response curves.			SAME	SAME	SAME	
3. Recognize Bandpass Filters by component types and placement, their application and their frequency response curves.			SAME	SAME	SAME	
4. Analyze Constant k and m Derived Filters and their application in state of the art electronics equipment.			SAME	SAME	SAME	
5. Solve for component values in filter circuits			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.22): *Understand principles and operations of sinusoidal and non sinusoidal oscillator circuits. EEC 1503, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. Assorted Components 2. DMM 3. Scope 4. Proto Board 5. Parts kit				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. List the requirements for proper operation of an oscillator.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
2. Describe the construction & operation of the phase shift oscillator.			SAME	SAME	SAME	
3. Explain how a multistage discrete amplifier can go into oscillation & how to prevent it.			SAME	SAME	SAME	
4. Describe the construction & operation of a Colpitts oscillator.			SAME	SAME	SAME	
5. Describe the construction & operation of a Clapp oscillator.			SAME	SAME	SAME	
6. Describe the construction & operation of a Hartley oscillator.			SAME	SAME	SAME	
7. Describe the construction & operation of an Armstrong oscillator.			SAME	SAME	SAME	
8. Compare the crystal controlled oscillator with other types of LC oscillators.			SAME	SAME	SAME	
9. Determine if a given oscillator circuit fulfills the Barkhausen criterion by performing circuit calculations.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.25): *Understand principles and operations of fiber optic circuits using photodiodes or LASERS. TCC 2313, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Demonstrate a fundamental under standing of fiber optics.		1. TDR 2. Splicer 3. Scope 4. Glass Fibers 5. TXMIT & Rectifier system	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/maintains**
2. Demonstrate an understanding of the applications of fiber optics in electronics.			SAME	SAME	SAME	
3. Explain refractive index & higher order modes.(Unit 2)			SAME	SAME	SAME	
4. Explain the characteristics of the fiber optics & signal components.			SAME	SAME	SAME	
5. Explain the physics of light generation.(Unit 3)			SAME	SAME	SAME	
6. Explain the characteristics of the laser diode & light emitting diode.			SAME	SAME	SAME	
7. Explain the principle of optoelectronic transducers.(Unit 4)			SAME	SAME	SAME	
8. Explain the function of the essential components of any fiber optic system.			SAME	SAME	SAME	
9. Explain the characteristics of couplers and connectors.(Unit 5)			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.28): *Understand principles and operations of signal modulation systems (AM, FM, stereo) (Page 1 of 4) ELT 212, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Define modulation & list the reasons for modulating an RF carrier.		1. TDR 2. Splicer 3. Scope with demo probe 4. Glass Fibers 5. Mod Meter 6. Function Generator 7. Trans & op amps 8. Circuits components	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Explain the relationship between sound waves & the human ear & how the waves can be converted to electrical impulses & used to modulate an RF Carrier.			SAME	SAME	SAME	
3. Analyze the modulation process, Absorption Modulation, Series & Plate modulation, formation of the modulation envelope, & determin ation of percent of modulation.			SAME	SAME	SAME	
4. Evaluate plate modulation of the different types of vacuum tubes & how it affects operating power.			SAME	SAME	SAME	
5. Examine the effects of modulation on sideband generation & bandwidth.			SAME	SAME	SAME	
6. Identify the different types of modulation & classify them as High or Low level.			SAME	SAME	SAME	
7. Evaluate the other types of modulation to include Heising & the three types of Grid (control, screen & suppressor) modulation.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

***Understand principles and operations of signal modulation systems (AM, FM, stereo)** (Page 2 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. TDR 2. Splicer 3. Scope with demo probe 4. Glass Fibers 5. Mod Meter 6. Function Generator 7. Trans & op amps 8. Circuits components				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
8. Calculate the percent of modulation using an oscilloscope.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
9. Evaluate the components of an AM modulated radio signal.(Unit 5)			SAME	SAME	SAME	
10. Analyze the procedures for detection & demodulation of an AM modulated wave.			SAME	SAME	SAME	
11. Describe the characteristics of & the differences between TRF. Superregenerative & Super eterodyne receivers.			SAME	SAME	SAME	
12. Identify & compare the operational characteristics of RF, IF, and AF amplifiers.			SAME	SAME	SAME	
13. Explain the relationship between the number of RF & IF amplifiers & the S/N ratio of receivers.			SAME	SAME	SAME	
14. Determine how automatic volume control (AVC) voltages are generated through AM Detection circuits.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.28): *Understand principles and operations of signal modulation systems (AM, FM, stereo) (Page 3 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1. Rf Gen with AM & FM capabilities 2. Splicer 3. Scope with demo probe 4. Glass Fibers 5. Mod Meter 6. Function Generator 7. Trans & op amps 8. Circuits components				**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
15. Determine how automatic gain control (AGC) voltages are developed from CW & SSB demodulation.			ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	
16. Analyze the make up of image frequencies, their affects on received signals, & how they can be eliminated through use of wave traps & filters.			SAME	SAME	SAME	
17. Explore the advantages of using double conversion superheterodyne receivers.			SAME	SAME	SAME	
18. Evaluate diversity reception (both frequency & space) to minimize selective facing.			SAME	SAME	SAME	
19. Practice the alignment procedures for AM receivers.			SAME	SAME	SAME	
20. Define frequency modulation (FM) & discuss the five major applications of FM.(Unit 6)			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.28): *Understand principles and operations of signal modulation systems (AM, FM, stereo) (Page 4 of 4)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 21. Analyze the basic concepts of frequency modulation.		1. TDR 2. Splicer 3. Scope with demo probe 4. Glass Fibers 5. Mod Meter 6. Function Generator 7. Trans & op amps 8. Circuits components	ACT Level 4 SCANS F1 b	ACT Level 6 SCANS F3 & F4	ACT Level 5 SCANS: SAME	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
22. List the main concepts of slope and phase locked loop detection.			SAME	SAME	SAME	
23. Describe the mechanics & applications of discriminators & detectors in FM demodulation.			SAME	SAME	SAME	
24. Explore the effects & requirements of FM IF limiter circuits.			SAME	SAME	SAME	
25. Analyze the application of pre emphasis & de emphasis, & squelch circuits in FM modulation & demodulation.			SAME	SAME	SAME	
26. Practice the proper procedures for the alignment of FM receivers.			SAME	SAME	SAME	
27. Accomplish FM using a varactor diode circuit.			SAME	SAME	SAME	
28. Produce FM by the direct & indirect methods.			SAME	SAME	SAME	
29. Describe phase modulation techniques & how voice is used to accomplish PM.			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.31): *Demonstrate an understanding of motor phase shift control circuits

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: This is beyond the scope of currently taught communications courses in community college courses. It is usually taught as part of radar or robotics courses.						

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.32): *Demonstrate an understanding of cathode ray tubes. (Page 1 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, infor mation, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Understand CRT components & application of each: a. Heater b. Cathode c. Grid d. Intensity control e. Focusing Anode & control f. Acceleration Anode g. Vertical deflection plates h. Horizontal deflection plates i. Aquadag coating j. power supply k. Vertical AMPS l. Horizontal AMPS & sweep generator m. A.C. & D.C. input functions n. XI X10 Probes		Oscilloscope Function Generator Asst. Capacitors, coils, & resistors	ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal**: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

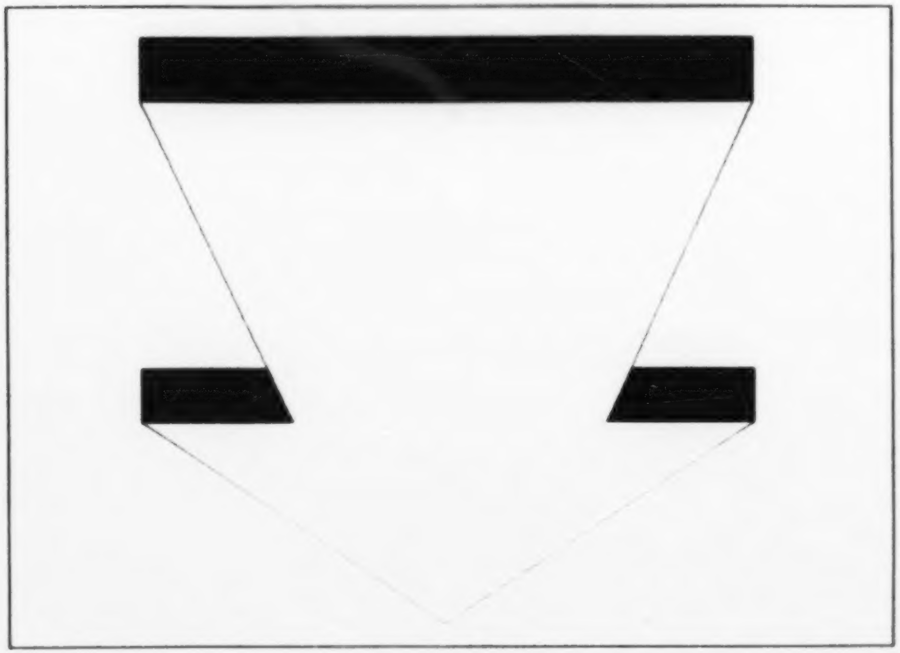
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (E.32): *Demonstrate an understanding of cathode ray tubes. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 2. Free running O'scope: a. Frequency measure b. Phase measure c. Lisstons pattern		Oscilloscope Function Generator Asst. Capacitors, coils, & resistors	ACT Level 4 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
3. Triggered Scope a. Time b. generator operation b. Frequency measurement using time B. generator			SAME	SAME	SAME	
4. Spectrum Analyzers Spacing of carrier, sideband, harmonics in frequency spectrum			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)



DIGITAL CIRCUITS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.01): *Demonstrate an understanding of the characteristics of integrated circuit (1C) logic families (Page 1 of 2) EEC 1203, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Name at least 3 distinct families of digital IC's and identify the 3 most popular and widely used types.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Describe the detailed operation and capabilities of TTL, ECL, and CMOS integrated circuits given a schematic diagram of the circuit.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.02): *Demonstrate an understanding of minimizing logic circuits using Boolean operations. (Page 1 of 2) EEC 1203, UNIT 4

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains**
1. Define Boolean Algebra.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Write the Boolean expression corresponding to a given logic circuit.			SAME	SAME	SAME	
3. Draw the symbolic logic circuit implementing or corresponding to a given Boolean expression.			SAME	SAME	SAME	
4. Write the Boolean expression corresponding to a given truth table.			SAME	SAME	SAME	
5. Develop a truth table corresponding to a given Boolean expression.			SAME	SAME	SAME	
6. Give an example of each of the two basic types of Boolean expressions.			SAME	SAME	SAME	
7. Minimize a given logic expression using the various roles of Boolean algebra.			SAME	SAME	SAME	
8. Implement a given Boolean expression with either NAND or NOR gates.			SAME	SAME	SAME	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.02): ***Demonstrate an understanding of minimizing logic circuits using Boolean operations.** (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
9. Write the two versions of DeMorgan's theorem.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
10. Write the Boolean expression of logic circuits using the wired OR connection.			SAME	SAME	SAME	
11. Properly connect the inputs & outputs of TTL & CMOS logic gates in typical applications.			SAME	SAME	SAME	
12. Simplify sum of product expressions using Boolean Theorem.(Unit 5)			SAME	SAME	SAME	
13. Simplify sum of product expressions using Karnaugh Maps.			SAME	SAME	SAME	
14. Write Boolean equations for combinational functions.(1303,Unit 1)			SAME	SAME	SAME	
			(EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062)	EIF 068, 072, 073	EIF 076, 077, 078, 047, 044	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.03): *Understand principles and operations of linear integrated circuits. EEC 1203, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Define & explain the operation of analog to digital (A/D) converters. 2. Define & explain the operation of digital to analog (D/A) converters.			ACT Level 5 SCANS F1 D SAME (EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062)	ACT Level 4 SCANS F3 SAME EIF 068, 072, 073	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME EIF 076, 077, 078, 047, 044	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.08): *Understand principles and operations of types of logic gates. (Page 1 of 2) EEC 1203, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
1. List the three basic types of logic elements.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
2. Draw the schematic & explain the operation of both diode & switch contact OR gates.			SAME	SAME	SAME	
3. Draw the schematic & explain the operation of both diode & switch contact AND gates.			SAME	SAME	SAME	
4. Draw the schematic & explain the operation of a transistor & switch contact inverter.			SAME	SAME	SAME	
5. Given a list of symbols, identify the industry standard symbols for inverters, AND, OR, NAND, & NOR gates.			SAME	SAME	SAME	
6. From a list of truth tables, identify the logic functions being performed.			SAME	SAME	SAME	
			(EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062; Speaking EIF 023)	EIF 068, 072, 073	EIF 076, 077, 078, 047, 044	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.06): *Understand principles and operations of types of logic gates. (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS:	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains**
7. Write a truth table for any of the basic logic functions: AND, OR, NOT, NAND, NOR.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	Thinking Skills: All Personal Qualities: All	
8. Given a list of logic equations, identify the logic function expressed by each.			SAME	SAME	SAME	
9. Write the logic equation for any of the basic logic functions AND, OR, NAND, NOR, NOT.			SAME	SAME	SAME	
10. Identify & explain the operation of exclusive OR gates.(1303, Unit 2)			SAME	SAME	SAME	
			(EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062; Speaking EIF 023)	EIF 068, 072, 073	EIF 076, 077, 078, 047, 044	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.09): *Understand principles and operations of combinational logic circuits. EEC 1203, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Write definition for combinational logic circuits.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Write a definition for sequential logic circuits.			SAME	SAME	SAME	
3. Draw a schematic and explain the operation of different configurations of combinational logic circuits.			SAME	SAME	SAME	
			(EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062; Speaking EIF 023)	EIF 068, 072, 073	EIF 076, 077, 078, 047, 044	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.12): *Understand principles and operations of types of flip flop circuits. EEC 1203, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Define the term flip flops. 2. Describe the operation of different types of flip flops: D, JK, RS. 3. Develop truth tables for the various types of flip flops. 4. Select the proper flip flops for a specific application.			ACT Level 5 SCANS F1 D SAME SAME SAME (EIF 056, 058, 059) (Listening 5 EIF 063; Writing 4 EIF 062; Speaking EIF 023)	ACT Level 4 SCANS F3 SAME SAME SAME EIF 068, 072, 073	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME SAME EIF 076, 077, 078, 047, 044	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.15): *Understand principles and operations of types of registers and counters. EEC 1203, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:					ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal: Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/maintains**
1. Discuss the operations of registers & counters.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3		
2. List some specific applications for registers & counters in digital circuits.			SAME	SAME	SAME	
3. Discuss registers as used for serial in/parallel out, serial in/serial out and bidirectional.(1303,Unit 3)			SAME	SAME	SAME	
4. Discuss shift registers made from flop flops.			SAME	SAME	SAME	
5. Discuss asynchronous & synchronous counters connected from basic flop flops.(1303,Unit 4)			SAME	SAME	SAME	
6. Discuss the use of counters as frequency dividers.			SAME	SAME	SAME	
7. Show logic for counter decoding.			SAME	SAME	SAME	
8. Calculate timing limitations on synchronous/asynchronous counters.			SAME	SAME	SAME	
9. Discuss truth tables for registers & counters.(1203, Unit 6)			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:

EIF SKILL STANDARD (F.18): *Understand principles and operations of clock and timing circuits. EEC 1303, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Discuss timing as used for one shot and multi vibrators.			ACT Level 5 SCANS F1 D	ACT Level 4 SCANS F3	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Calculate timing limitations on synchronous and asynchronous counters. (Unit 4)			SAME	SAME	SAME	
3. Calculate propagations delays. (Unit 1)			SAME	SAME	SAME	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.21): *Understand principles and operations of types of arithmetic logic circuits. EEC 1803, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Analyze truth tables and timing diagrams of sum of products circuits. 2. Analyze truth tables and timing diagrams of product of sum circuits.		1.Data and reference manuals.	ACT Level 5 SCANS F1-6 SAME (Listening EIF 063 Speaking EIF 023,027 Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME [illegible]	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME [illegible]	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; Interpersonal: Team: Participates as team; teaches others, Leadership communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity**: works with others, Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: understands systems; monitors/corrects performance; improves; Technology: Selects/Applies/ maintains

*(Know the technical basis for, and be able to explain how, the product/device/circuit works)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.24): *Understand principles and operations of types of multiplexer and demultiplexer circuits. EEC 1303, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Analyze truth tables and timing diagrams of multiplexer circuits 2. Analyze truth tables and timing diagrams of demultiplexer circuits		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b SAME (Listening EIF 063; Speaking EIF 023,027, Writing EIF 062)	ACT Level 5 SCANS F3 & F4 (EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All (EIF 043,044,045, 047,050)	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership** communicates ideas to justify position, persuades/ convinces, responsibly challenges, **Works with Diversity**: works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information, uses computer to process information Systems: understands systems, monitors/corrects performance, improves, Technology: Selects/Applies/ maintains

*(Know the [illegible] able to explain how, the product/device/circuit works.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.27): *Understand principles and operations of types of digital to analog and analog to digital circuits. EEC 1203, UNIT 6

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Analyze truth tables and timing diagrams of digital to analog converter circuits. 2. Analyze truth tables and timing diagrams of analog to digital circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b Listening EIF 063 Speaking EIF 023,027 Writing EIF 062	ACT Level 5 SCANS F3 & F4 EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090 Level 5	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: EIF 043,044,045, 047,050	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/ maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.30): *Understand principles and operations of types of digital display circuits. EEC 1303, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Analyze truth tables and timing diagrams of decoder driver circuits. 2. Analyze truth tables and timing diagrams of counter circuits.(Unit 4) 3. Analyze segment display circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b SAME SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME SAME (EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME (EIF 043,044,045, 047,050)	**Resources: Time**: Selects goal relevant activities; ranks goals, allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/ maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter/Administration

EIF SKILL STANDARD *Understand principles and operations of digital power distribution and noise problems. EEC 1203, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Analyze propagation delay of logic circuits.		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** Technology: **Selects/Applies/ maintains**
2. Analyze power dissipation of logic circuits.			SAME	SAME	SAME	
3. Analyze Speed Power trade off in logic circuits.			SAME	SAME	SAME	
4. Analyze noise immunity as percentage of supply voltage on digital circuits.			SAME	SAME	SAME	
5. Analyze fan out of logic circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.36): *Understand principles and operations of types of digital encoders and decoders. EEC 1203, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7 Hand tools 8 Anti static equipment 9. Data book				Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; Interpersonal: **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; Information: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information Systems: **understands systems; monitors/corrects performance; improves;** Technology: **Selects/Applies/ maintains**
1. Analyze BCD to Decimal decoders circuits.			ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	
2. Analyze Octal decoders circuits.			SAME	SAME	SAME	
3. Analyze Hex decoders circuits.			SAME	SAME	SAME	
4. Analyze BCD to 7 Segment decoder circuits.			SAME	SAME	SAME	
5. Analyze simple encoder circuits.			SAME	SAME	SAME	
6. Analyze Decimal to BCD encoder circuits.			SAME	SAME	SAME	
7. Analyze 8 input priority encoder circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Maintenance/Installation/Repair/Evaluation/Troubleshooter

EIF SKILL STANDARD (F.39): *Understand principles and operations of digital display devices. EEC 1303, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks:		1.Digital Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book			ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources**: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal**: **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/ maintains**
1. Analyze BCD to Decimal decoders circuits.			ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4		
2. Analyze Octal decoders circuits.			SAME	SAME	SAME	
3. Analyze Hex decoders circuits.			SAME	SAME	SAME	
4. Analyze BCD to 7 Segment decoder circuits.			SAME	SAME	SAME	
5. Analyze simple encoder circuits.			SAME	SAME	SAME	
6. Analyze Decimal to BAD encoder circuits.			SAME	SAME	SAME	
7. Analyze 8 input priority encoder circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 066,067,069,069 072,073,074,075,076,077,078,082,084,085,086,087,089,090)	(EIF 043,044,045, 047,050)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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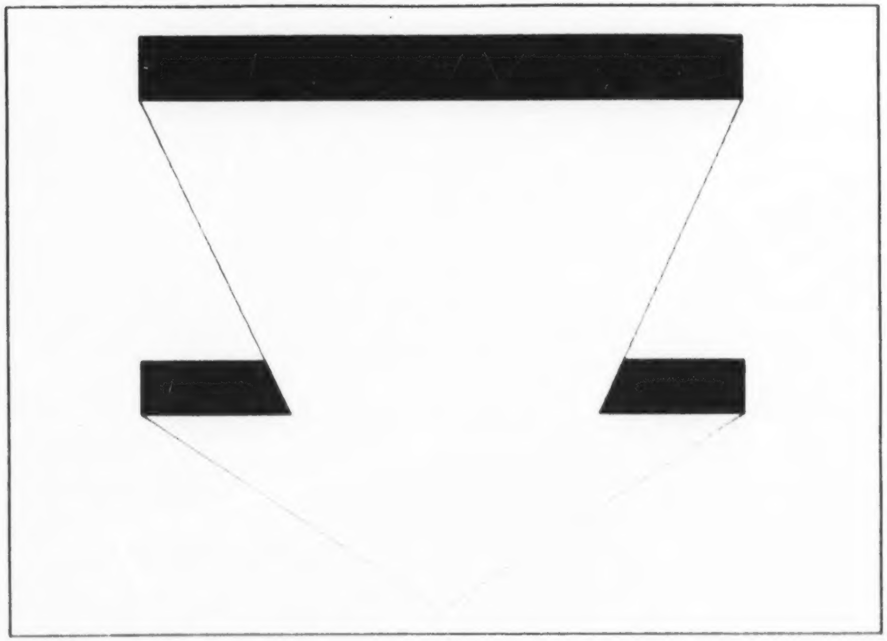

MICROPROCESSORS

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluate/Troubleshooting/Repair

EIF SKILL STANDARD (G.01): *Demonstrate an understanding of microprocessor peripherals and their interfaces. CMT 1603, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills	Occupational Theory					
Steps 1. Build and analyze a micro processor memory interface.		1. Microprocessor Trainer 2. Discrete relevent electronic components. 3. Multimeters 4. Oscilloscopes 5. Logic Probes 6. Login Analyzer 7. Hand tools 8. Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance** **Technology: Selects, understands**
2. Analyze a microprocessor buss controller.			SAME	SAME	SAME	
3. Analyze a microprocessor interupt controller.			SAME	SAME	SAME	
4. Build, analyze and program a Programmable Parrallel Interface (PPI).			SAME	SAME	SAME	
5. Build and analyze a sync/async serial interface.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 073,066)	(EIF 044,EIF047)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluate/Troubleshooting/Repair

EIF SKILL STANDARD (G.02): *Demonstrate an understanding of troubleshooting and repair of microprocessor peripheral interfaces. CMT 2004,

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Understand Signal modulation systems 2. Understand motor phase shift control circuits 3. Understand cathode ray tubes		EIF02,EIF08 EIF022,EIF018,EIF017,EIF015,EIF019 Data book	ACT Level 5 SCANS F1 b SAME SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME SAME (EIF 073,066)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME SAME (EIF 044,EIF047)	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance** **Technology: Selects, understands**

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Repair/Evaluation/Troubleshooting/Installation

EIF SKILL STANDARD (G.03): ***Demonstrate an understanding of types of microprocessor peripherals. CMT 1603, UNIT 1**

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Build and analyze a micro processor memory interface.		EIF02,EIF08 EIF022,EIF018,EIF017,EIF015,EIF019 Data book	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility**: Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others;Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity**: works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance** **Technology: Understands, selects**
2. Analyze a microprocessor buss controller.			SAME	SAME		
3. Analyze a microprocessor interupt controller.			SAME	SAME	SAME	
4. Build, analyze and program a Programmable Parrallel Interface (PPI).			SAME	SAME	SAME	
5. Build and analyze a sync/async serial interface.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 06)2	(EIF 073,066)	(EIF 044,EIF 047)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function:Evauation/Troubleshooting

EIF SKILL STANDARD (G.04): *Demonstrate an understanding of essential microprocessor components. CMT 1603, UNIT 3

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: Write, assemble, execute and debug machine language programs involving use of ALU, Data and Index registers, Segment registers and internal busses.		Logic Probes Multimeters Oscilloscopes Data Book	ACT Level 5 SCANS F1 b (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 (EIF 073,066)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All (EIF 044,EIF 047)	**Resources: Time**: Selects goal relevant activities, ranks goals, allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others, **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/ corrects performance; improves;** **Technology: Selects/Applies/ maintains**

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/installation/repair

EIF SKILL STANDARD (G.05): *Demonstrate an understanding of the use of a microcomputer operating system. IMT 1013

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:		1. Microcomputer. 2. Appropriate OS and diagnostic software. 3. Anti virus software.			ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources:** **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology**: Selects/Applies/ maintains
1. Write arithmetic functions.			ACT Level 5 SCANS F1 b	ACT Level 4 SCANS F3 & F4		
2. Analyze booting sequence.			SAME	SAME	SAME	
3. Generate time and date codes for files.			SAME	SAME	SAME	
4. Low and High level Format diskettes and hard drives.			SAME	SAME	SAME	
5. Perform sector and track analysis.			SAME	SAME	SAME	
6. Using DOS service routines.			SAME	SAME	SAME	
7. Troubleshoot bugs and viruses on operating system.			SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 073,066 Level 4)	(EIF 044,EIF 047)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/installation/repair

EIF SKILL STANDARD (G.08): *Demonstrate an understanding of microprocessor BUS concepts. CMT 1803, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Build and analyze timing bus sequences.		1.Micropro Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9. Data book	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule; **Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team:** Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/ convinces, responsibly challenges; **Works with Diversity:** works with others. **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology: Selects/Applies/ maintains**
2. Build and analyze data and address bus controllers circuits.			SAME	SAME	SAME	
3. Build and analyze interrupt controllers circuits.			SAME	SAME	SAME	
4. Build and analyze clock and timing generation circuits.			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 073,066)	(EIF 044,EIF 047)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/installation/repair

EIF SKILL STANDARD (G.07): *Demonstrate an understanding of microprocessor components and terminology (CPU, AU, Device Driver, ROM, RAM, EPROM, etc.) (Page 1 of 2) CMT 1603, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Build and analyze a microprocessor memory interface.		1.Micropro Trainer 2.Discrete relevant electronic components. 3.Multimeters 4.Oscilloscopes 5.Logic Probes 6.Logic Analyzer 7.Hand tools 8.Anti static equipment 9.Wordprocessing and schematic editor software 9. Data book	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule;**Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:Team**: Participates as team; **teaches others; Leadership** communicates ideas to justify position, persuades/convinces, responsibly challenges; **Works with Diversity:** works with others; **Information**: Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Analyze a microprocessor buss controller.			SAME	SAME		
3. Analyze a microprocessor interrupt controller.			SAME	SAME		
4. Build, analyze and program a Programmable Parallel Interface (PPI).			SAME	SAME		
5. Build and analyze a sync/async serial interface.			SAME	SAME		
6. Build and analyze timing bus sequences.			SAME	SAME		
7. Build and analyze data and address bus controllers circuits.			SAME	SAME		
8. Build and analyze interrupt controllers circuits.			SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	SAME EIF 073,066 Level 5	(EIF 044,EIF 047)	

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/installation/repair

EIF SKILL STANDARD (G.07): *Demonstrate an understanding of microprocessor components and terminology (CPU, AU, Device Driver, ROM, RAM, EPROM, etc.) (Page 2 of 2)

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
(continued) 9. Build and analyze clock and timing generation circuits. 10. Report and record keeping on all experimentation and project building. 11. Summarization and essay writing on microprocessor and micro processor related components.		SAME	SAME	SAME	SAME	SAME

*(Know the technical basis for the workings of a product/device/circuit/procedure and be able to demonstrate that knowledge.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/installation/repair

EIF SKILL STANDARD (G.08): *Understand principles and operations of types of microprocessor memory circuits. CMT 1603, UNIT 1

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/skills required)
	Occupational Theory					
Tasks: 1. Formulate and use different read/write ROM addressing schemes		1.Micropro Trainer 2.logic Probes 3.Logic Analyzer 4.Hand tools 5.Anti static equipment 6.Wordprocessing and schematic editor software 7. Data book 8. PROM burner	ACT Level 5 SCANS F1 b	ACT Level 5 SCANS F3 & F4	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All	Resources: **Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule;**Material/ Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position,persuades/ convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**:Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/maintains**
2. Formulate and use different read/write DRAM and SRAM addressing schemes			SAME	SAME	SAME	
3. Formulate and use different read/write EPROM addressing schemes			SAME	SAME	SAME	
4. Formulate and use DMA addressing schemes			SAME	SAME	SAME	
			(Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	(EIF 073,066)	(EIF 044,EIF 047)	

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).

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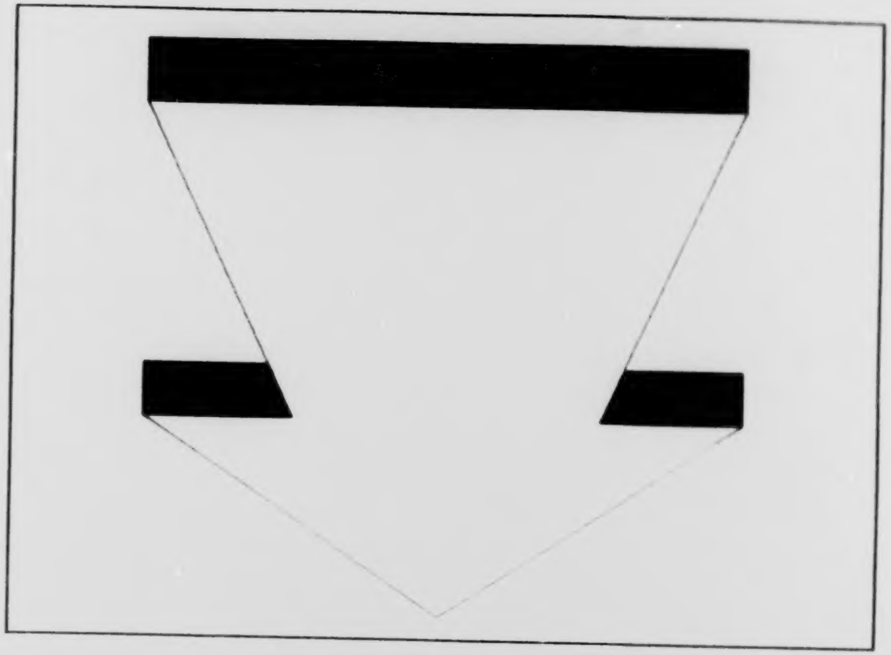
Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: Evaluation/troubleshooting/repair

EIF SKILL STANDARD (G.11): *Understand principles and operations of Microprocessor machine code and instruction sets. CMT 1603, UNIT 2

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Using DEBUG/MASM design, write and debug machine language programs on MC6800 microprocessor. 2. Using DEBUG/MASM design, write and debug machine language programs on 8088 microprocessor.		1. Microcomputer 2. Microprocessor trainer	ACT Level 5 SCANS F1 b SAME (Listening EIF 063; Speaking EIF 023,027; Writing EIF 062)	ACT Level 5 SCANS F3 & F4 SAME (EIF 066,067,069 072,073,074 075,076,084 090)	ACT Level 5 SCANS: Thinking Skills: All Personal Qualities: All SAME (EIF 043,EIF 044 EIF 047,EIF 050)	**Resources: Time**: Selects goal relevant activities; ranks goals; allocates time; Prepares & follows schedule;**Material/Facility:** Acquires, stores, uses materials efficiently; **Interpersonal:** **Team**: Participates as team; **teaches others; Leadership**: communicates ideas to justify position, persuades/convinces; responsibly challenges; **Works with Diversity:** works with others; **Information**:Acquires, evaluates, organizes, maintains, interprets, communicates information; uses computer to process information **Systems: understands systems; monitors/corrects performance; improves;** **Technology:** **Selects/Applies/ maintains**

*(Know the technical basis for, and be able to explain how, the product/device/circuit works).



GENERAL

Occupation: Electronic Technician
Duty Area/Function: All

Task Analysis Worksheet

EIF SKILL STANDARD: Understand the principles of communications Systems. EEC 1211, ALL

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. RF system safety 2. Transmission line applications 3. Antenna systems 4. Radio transmitters and receivers 5. Types of multiplexing systems 6. Data communications 7. Fiber optic communication systems 8. Types of telephone switching systems 9. Microwave communications systems						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of product servicing. ELT 2222

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks:						
1. Surface mount devices						
2. Radio and TV receiving systems						
3. Analog and digital video recording and playback systems						
4. Laser disk systems						
5. Home electronics systems a. Home automation b. FAX machines c. Computer games d. Personal telephones e. Electronic security f. Telephone systems						
6. Analog and digital audio systems						
7. Microwave ovens						
8. CATV/SATV antenna systems						
9. Photocopier systems						
10. LASER printing						
11. CCITT standards						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of Computer/Microcomputer Servicing.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Computer/microcomputer systems architecture 2. Computer programming fundamentals 3. Computer/microcomputer operating systems 4. Computer/microcomputer applications software 5. Computer/microcomputer networking 6. Computer/microcomputer processor/ coprocessor circuits 7. Computer communications interfacing 8. Peripheral equipment 9. Display terminals and interface controllers 10. Printers and interface controllers 11. Magnetic tape equipment and interface controllers 12. Disk storage equipment and interface controllers 13. CD ROM equipment and interface controllers 14. Cabling interconnects						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of Electromechanical. ELT 2222

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Electronic and mechanical blueprint reading 2. Motors and motor control circuits (Art 226,Unit 8 all) a. Power distribution systems (Unit 4, A D) b. Relays and relay circuits (Unit 11, A G) c. Protection circuits (Unit 9, A D) d. Types of motor controllers (Units 11 & 13, A G) e. Types of motors (Unit 13, A E) 3. Hydraulic and pneumatic systems 4. Mechanical power transmission systems a. Measuring instruments b. Compound and reverted gear trains c. Internal and planetary gear trains d. Helical and bevel gear trains e. Rack and pinion mechanisms f. Worm and wheel mechanisms g. Block and screw mechanisms						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of Electromechanical (continued).

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 4. h. Counter rotating mechanisms and differentials, etc. 5. Vacuum status 6. Mechanisms, linkages and levers 7. Transducers and instrumentation 8. Industrial materials 9. Automatic controls and robotics						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

Occupation: Electronic Technician
Duty Area/Function: All

Task Analysis Worksheet

EIF SKILL STANDARD: Understand the principles of LASER Application. ELT 131, Unit E

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Welding, cutting and drilling (1 7) 2. Data recording and manipulation (6) 3. Environmental testing and monitoring 4. Nondistinctive testing 5. Measurement (5) 6. Communications (6) 7. Fiber optics and lasers 8. Lasers in medicine (4) 9. Holography/interferometry (1 7)						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of Biomedical Systems.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. Electrical safety analyzer and its use 2. Medical specialty test equipment and their uses 3. Defibrillator analyzer and its use 4. Floor conductivity checker and its use 5. Mercury manometers/uses 6. EKG simulator and its use 7. Photo tachometer/its use 8. Ultrasound watt meter/its use 9. Biomedical industry specific codes and regulations 10. Chemical safety 11. Medical gas/pressure safety 12. Infectious disease safety 13. Thermal safety 14. Radiation safety 15. Medical equipment operational procedures and clinical applications 16. Thermistor control circuits 17. Crystal oscillators 18. Hartley oscillator 19. Anatomy and physiology 20. Medical terminology						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

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Task Analysis Worksheet

Occupation: Electronic Technician
Duty Area/Function: All

EIF SKILL STANDARD: Understand the principles of Automotive Service.

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
	Occupational Theory					
Tasks: 1. On board self diagnostic systems(AUT 1424, Unit 6, 6.1 6.33) 2. Driveability problems and relation to faults (Unit 10, 10.1 10.47) 3. Engine control problems and faults (Unit 5, 5.1 5.36) a. Insufficient or no spark b. Cylinder misfire 4. System specific diagnostic tests (AUT 1125,Unit 1 12, 1 9) a. Ignition system b. Battery/starting/charging system c. Transmission control system d. Anti lock brake control system e. Suspension and steering control systems f. HVAC electronic control systems h. Lighting systems i. Instrumentation and gauges j. Body electrical systems						

*Have an overview perspective of the principles/concepts or the workings of a product/device/circuit/system.)

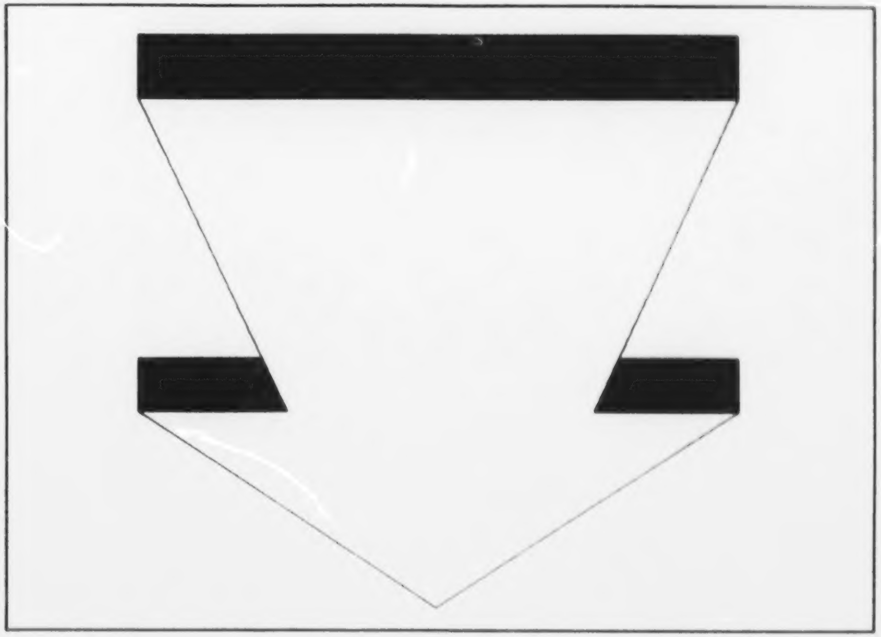
TABLE H

EIF

BASIC AND PRACTICAL SKILLS

600

599



BASIC AND PRACTICAL SKILLS

BASIC AND PRACTICAL SKILLS

Skill Descriptors

•Demonstrate ________________

(Show the capability to perform a process or exhibit a behavior)

Work Ethics and Behavior

01 Implement responsibilities of job position including exhibiting dependability, and following the chain of command
02 Follow rules, regulations and policies as established including interpreting employer/employee handbook/procedure
03 Practice cost effectiveness
04 Practice time management and follow work schedule
05 Assume responsibility for own decisions and actions
06 Exhibit pride
07 Initiative
08 Assertiveness
09 Demonstrate willingness to learn
010 Seek work challenges
011 Maintain regular attendance
012 Apply ethical reasoning to decisionmaking

Technical Literacy

013 Basic keyboarding skills
014 Computer skills
  a. Word processing
  b. Data base
  c. Spreadsheet
  d. Sketching application
  e. Windowing applications
015 Recognize impact of technological changes on tasks and people including:
  Participating in service training
  Maintain state-of-the-art skills
  Update skills
  Participate in continuing education
  Diversify education experience
016 Understand and apply Total Quality Management principles

BASIC AND PRACTICAL SKILLS

Skill Descriptors

Interpersonal Relationships
017 Respond constructively to praise or criticism
018 Provide constructive praise or criticism
019 Channel/control emotional reactions constructively
020 Resolve conflicts
021 Display a positive attitude
022 Sensitivity to customer needs

Communicating on the Job
023 Use correct grammar
024 Write legibly
025 Use telephone etiquette including relaying messages orally and in writing
026 Employ listening skills including listening attentively to supervisors, coworkers and customers
027 Interpret written, graphic and oral instructions
028 Employ non-verbal communication
029 Interact with customer on component/system functioning in a logical, clear and understandable manner
030 Conduct in-service training for customers
031 Communicate equipment status and operations to customer
032 Communicate work status to supervisors
033 Communicate with co-workers

Maintaining Professionalism
034 Demonstrate knowledge of your business products/services
035 Exhibit positive behavior including using courtesy and respecting other workers' jobs
036 Comply with company standards concerning dress and appearance including demonstrating personal hygiene and cleanliness, and wearing attire suitable to the work place
037 Participate in meetings in a positive and constructive manner
038 Comply with organizational expectations
039 Use job-related terminology
040 Treat people with respect
041 Learn new concepts and technology through self study and lifelong learning

BASIC AND PRACTICAL SKILLS

Skill Descriptors

Solving Problems and Critical Thinking

042 Identify the problem including assessing values and norms, and identifying attitudes, beliefs and responsibilities
043 Clarify purposes and goals
044 Identify available solutions and their impact including evaluating credibility of information, and locating information
045 Evaluate options
046 Set priorities
047 Select/implement options/decisions including predicting results of proposed action
048 Organize workloads
049 Assess employer/employee responsibility in solving a problem
050 Generate new ideas and solve problems using brainstorming techniques

Team Work

051 Identify style of leadership required for effective team work
052 Establish team's operating procedures including:
  Identifying group tasks
  Matching members and group tasks
  Setting time frame to accomplish tasks
  Demonstrating negotiating and conflict management skills
053 Work productively with others
054 Complete a team task including:
  Sharing information, ideas and options with others
  Demonstrating procedures and assisting others
  Coming to closure
055 Evaluate outcome

Basic Foundation Skills

Reading
056 Manufacturers literature
057 Codes and regulations
058 Charts and graphs
059 Schematic diagrams
060 Flow diagrams

BASIC AND PRACTICAL SKILLS

Skill Descriptors

Writing

061 Technical reports, letters and memoranda to:
  a. Supervisors
  b. Manufacturers
  c. Customers
  d. Co-workers
062 Document lab projects, procedures, test logs and equipment failure reports

Listening

063 Listens attentively
064 Assess signs and symptoms of malfunctions
065 Listening to customers

Proficiency in Mathematics

Numbers and Number Relations

066 Round and/or truncate numbers to designated place value
067 Compute and solve problems involving integers, fractions, decimals, and percentages using order of operations
068 Compare order and determine equivalences of real numbers (e.g., fractions, decimals, percentages)
069 Estimate, apply, and solve problems involving fractions, decimals, percentages, and real numbers
070 Set up,solve, and apply ratios and proportions
071 Solve problems and make applications involving integers, fractions, decimals, percentages, ratios, and proportions
072 Translate written and/or verbal statements into mathematical expressions
073 Compare, compute, and solve problems involving binary, octal, decimal, and hexadecimal numbering systems

BASIC AND PRACTICAL SKILLS

Skill Descriptors

Measurement

074 Convert, compare, and compute with common units of measurement within and/or across measurement systems

075 Read scale on measurement device(s) to nearest mark and make interpolations where appropriate

Data Analysis and Probability

076 Interpret and use tables, charts, maps, and/or graphs

077 Identify patterns, note trends, and/or draw conclusions from tables, charts, maps, and/or graphs

078 Collect and organize data into tables, charts, and/or graphs

079 Compute and interpret mean, median, and/or mode

080 Understand process control techniques and statistical terms and charts needed for interpretation of Total Quality Management operation

Algebra

081 Evaluate and/or simplify algebraic expressing using simple substitutions

082 Solve linear equations

083 Use order of operations to solve problems

084 Use formulas

085 Compare and compute using scientific notation

086 Use properties of exponents

087 Select and use appropriate problem-solving techniques

088 Determine slope, midpoint and distance

089 Graph functions

090 Use Boolean algebra

Geometry

091 Find perimeters and areas of geometric figures

092 Find surface areas and volumes of applicable geometric figures

093 Recognize, classify, and use properties of lines and angles

094 Recognize, classify, and use properties of two- and three- dimensional figures (e.g., circles, triangles, rectangles, cylinders)

095 Apply Pythagorean theorem

BASIC AND PRACTICAL SKILLS

Skill Descriptors

Trigonometry

096 Identify basic functions of sine, cosine, and tangent
097 Compute and solve problems using basic trigonometric functions
098 Graph basic functions using polar and/or Cartesian coordinate systems

CURRICULUM ENHANCEMENT

for

Electronic Engineering Technician Curriculum

Texas Skill Standards and Certification Project

Document II

by

Texas Instruments

and

The University of North Texas

with support from

The Electronics Industry Foundation

prepared by:

Bill E. Lovelace
Jessie Teddlie

Jointly Sponsored, Funded and Conducted
by the
Tri-Agency Partnership

June 1994

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Disclaimer: This study was conducted pursuant to a contract with the Tri-Agency Partnership. Contractors undertaking such projects are encouraged to express freely their judgement in professional and technical matters. Points of view or opinions do not, therefore, necessarily represent official position or policy of the Tri-Agency Partnership.

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V. Enhancements . . . . II - 11

CURRICULUM ENHANCEMENT

I. Introduction

The **Texas Skill Standards and Certification Projects** sponsored by the Tri-Agency Partnership were to produce four documents: (1) **SCANS Occupational Handbook;** (2) **Enhanced Curriculum Package;** (3) **Testing and Certification Strategies;** and (4) a **Professional Development Plan.**

The **Texas Skills Development Program** was initiated for the purpose of developing "*an education and work force training system that has the ability to measure and ensure that workers have the skills needed by business and industry to compete in a global economy.*" The "**TEXAS SKILLS DEVELOPMENT PROGRAM: Report to the Governor**", August, 1993, recommended that the skills required to enter employment identified by the Secretary's Commission on Achieving Necessary Skills (SCANS) be adopted as core skills "*which employers say are fundamental to success in the workplace.*"

The Secretary's Commission on Achieving Necessary Skills (SCANS) conducted research to verify "*workplace know-how*" which defines effective job performance today. In the SCANS document, **WHAT WORK REQUIRES OF SCHOOLS** it is stated:

> ***"This report identifies five competencies and a three-part foundation of skills and personal qualities that lie at the heart of job performance. These eight requirements are essential preparation for all students, both those going directly to work and those planning further education."*** **and** ***"These competencies differ from a person's technical knowledge."***

Another report of SCANS, "**SKILLS AND TASKS FOR JOBS**" was issued by the commission to assist educators make high school courses more relevant to the needs of a competitive workforce. The job analysis process used for this report was not definitive since time and resources did not permit the use of a valid sample of occupations or persons within occupations to assure the SCANS competencies and foundations were generic to all occupations.

It was stated in the report, "SKILLS AND TASKS FOR JOBS" that:

> *"Individuals developing high school curricula will find this report a useful way to relate teaching of high school subject matter to the skills required in the workplace. It will help them teach these skills in existing or new curricula and develop instructional strategies. These skills can be taught in a range of courses from art and music to science and mathematics."*

Based on the review of the documents cited above, it is concluded that concepts of education and training that are being advocated in a subliminal mode are that instructional content and teaching methods must be revised to assure that:

- Instructional content is taught in context - "*learning to know*" is taught in relation to "*learning to do*";
- Instructional content is derived from the workplace for career preparation;
- Skills developed other than specific job tasks are transferable;
- Included assessments that are criterion referenced and performanced based with pre-established standards of performance.

The "*SCANS Skills*" are workplace skills that have been identified by SCANS as being common or generic to many different occupations. Based on the statement, "*The competencies differ from a person's technical knowledge.*", made in the SCANS report, **WHAT WORK REQUIRES OF SCHOOLS**, it is concluded that the SCANS Skills are not the technical skills or skill standards required by the different occupations of the workplace.

The emphasis of the publications resulting from the SCANS have been on the restructuring of the K - 12 curricula to assure that students completing high school have attained the generic workplace skills identified by SCANS research.

The curriculum enhancement for the technical courses included in this document were developed based on the premise that the SCANS Skills are core and should be **prerequisite** to the technical courses in any occupational preparation curriculum. Appropriate application and the development of higher levels of proficiency of the SCANS Skills in relation to the **appropriate technical skill** should be the primary purpose of technical content for the SCANS skills.

II. Procedures

During the preparation of this proposal, research was conducted to determine the impact of "*curriculum enhancements*" that were done by previous educational initiatives having similar, if not the same purposes as the Skill Standards and Certification Projects. A review of such "*curriculum enhancements*" done by the correlated curriculum movement in response to Sputnik, the Career Education Act, the mandate for the integration of the curricula and teaching methodologies of the academic and vocational instruction by the Carl Perkins Act, and Education Goals 2000 revealed that the majority of the "*curriculum enhancements*" were made in the form of "*add-ons*" to curricula and courses of the curriculum. "*Add-ons*" that are external to the curricula do not upgrade the curriculum on a permanent basis. Experience has shown that as soon as funding is removed or the initiative is overshadowed by a new initiative or reform in education that the add-ons disappear.

The research also revealed, that during the process of infusing or including identified curricula enhancements into basic course outlines of the curricula, the enhancement was implied in the curriculum, but had not been included in the basic course outlines of the courses of the curriculum being improved by the enhancement. It was also revealed that when the enhancement was included in the appropriate basic course outlines that the enhancement remained after funding for the educational initiative was gone.

Based on the results of research conducted to identify the most successful procedures for enhancing curricula to achieve long-term impact, it was determined that enhancing the curriculum by enhancing or improving basic course outlines was the one of the most effective procedure to use.

In the proposal for electronic engineering technicians submitted in response to the RFP for Skill Standards and Certification Project, it was stated:

> *"The curriculum enhancements, performed by consultant writers, will be done by adding curriculum deficient SCANS Skills to the basic course outline of the appropriate (related) courses of the current curriculum. By adding or including the SCANS ¦Skills, by required level, to the basic course outlines the desired flexibility needed to assure replication and applicability across programs and institutions at the classroom levels will be assured.*
>
> *The use of the basic course outline as a vehicle or format for infusing the SCANS Skills into existing curriculum provides an opportunity to enhance curriculum in any one of the basic course outline components. For example, infusion or integration of a SCANS Skill may be most effective by including the skill in one of the objectives or instructor/student activities components of the basic course outline."*

The curriculum enhancements for the electronic engineering technicians curriculum are infused into the curriculum by the use of the basic course outlines of courses of the curriculum.

During the preparation of the proposal for this Skills Standards and Certification project, a cursory review was made of the existing curricula of the Job Enhancement Program of Texas Instruments (JEP) and the Texas Educational Articulation Model (TEAM) for training electronic engineering technicians. It was concluded, as a result of the cursory review, that the extent to which the current curricula trains in the SCANS skills defined by ACT Work Key examples was minimal.

In order to identify instructional content of an occupational preparation program a job analysis and task analysis must be made of the requirements of the workplace for the occupation or cluster of occupations for which the occupational preparation program is being developed.

This project used the results of the job analysis performed by the Electronics Industries Foundation and the job profiling technique performed by American College Testing. The results of the two analyses were used to develop a list of duties and tasks performed by an electronic engineering technician. The lists of duties and tasks performed by entry level electronic engineering technician are presented in the project document, ***OCCUPATIONAL ANALYSES HANDBOOK FOR ELECTRICAL ENGINEERING TECHNICIANS.***

A task analysis was performed of each task on the list of tasks to identify instructional content needed for teaching the task. An example of the task analysis worksheet used by instructors of electronics engineering technicians preparation programs is presented in Figure II - A. The results of the task analyses performed for identifying the instructional content of the electronic engineering technician curriculum is also presented in the ***OCCUPATIONAL ANALYSES HANDBOOK FOR ELECTRICAL ENGINEERING TECHNICIANS.***

The results of the analysis of each of the tasks was then compared to the instructional content of the existing curriculum by instructors of the electronic engineering technicians program for determining which of the SCANS skills needed to be infused into the existing curriculum of TEAM and Texas Instruments Job Enhancement Program. An example of the Discrepancy Analysis Form used is found in Figure II - B. It was found

Example of a Task Analysis
Worksheet Format

Occupation:
Duty Area/Function:

EIF Skill Standard: ______________________________

Technology		Tools, Equipment Materials Used	Communication Skills (List Reading, Listening, Speaking, Writing Skills used and level required)	Math Skill (List math skills used and level required)	Reasoning Skills (List creative, decision and problem solving skills used)	SCANS Competencies (List resources, information, interpersonal and systems competencies/ skills required)
Performance Skills	Occupational Theory					

Figure II - A

Discrepancy Analysis Sheet

EIF Skills Standards		TEAM Electronics Curriculum						
				Performance Objective			Included in TEAM	
Code	Standard	Course #	Unit #	Code	Statement	SCANS Competency Required	Yes	No

Figure II - B

that two barriers prevented an expeditious identification of the SCANS skills that were deficient in the existing curriculum.

The first barrier was that the purpose of the SCANS job analysis was to identify workplace skills that were common or generic to many different occupations for entry level workers. Also, the SCANS research findings were not definitive in relation to the "entry-level" workers.

The second barrier that surfaced in the identification of the deficiencies of SCANS skills in the curriculum was the lack of detail found in the description of the instructional content of the existing curricula. It was found that the highest level of detail of instructional content that existed was that of course syllabi in relation to the TEAM curricula. The TEAM curricula was horizontal and used as a guide by a minimum of 15 community/technical colleges. It is advanced because of the funds received from the Texas Higher Education Coordinating Board to allow a group of instructors to evaluate and upgrade the curricula which would be adopted for use by all members of the TEAM Consortium. However, what is not shown in the TEAM document is the lesson plans and laboratory assignments which do include the teaching and application of SCANS skills.

It was determined by the instructors from the TEAM Consortium who were assigned the responsibility of identifying the SCANS skills that were not included in the curriculum, that the skills **were being applied but had not been documented as a skill to be developed.** Course syllabi do not provide for this level or detail of description of instructional content.

Individual interviews with instructors revealed that the SCANS skills were being taught and applied in the curriculum as a result of their personal knowledge of what an electronic engineering technician must "**know**" and "**do**". Therefore, the "curriculum enhancement" of this project are not what SCANS skills must be added to or integrated into the existing curriculum, but examples of how documentation can be made that the SCANS skills are being applied and taught if not previously acquired by students in the existing curriculum.

The Job Enhancement Curricula of the Texas Instruments' instructors did document how the SCANS Foundations were taught in context and were transferable.

III. Curriculum Enhancements

The following curriculum enhancements were developed on the premise that the SCANS Skills are generic to many occupations, are core content, and should be prerequisite to technical instruction. The curriculum enhancements are presented in the format of a basic course outline. The format of a basic course outline was selected because it provides for enough detail to provide for:

- Name of Course
- The identification of the unit of instruction
- The instructional objective written in performance terms
- Enabling objectives if needed
- A listing of instructor and student activities
- Modes of instructional delivery
- References
- Equipment/supplies
- Evaluation (knowledge assessments/performance assessments)

The enhancements presented on the pages following the "Conclusions" show an integration of the SCANS Skills in a variety of ways. In some cases, the SCANS competencies are: taught and applied; reviewed and applied; and only applied. The SCANS foundation enhancements (JEP) provide a description of how the foundations are taught in context.

IV. Conclusions

Based on the review of reports of SCANS research needed to complete this component of the Texas Skills Standards and Certification Projects for electronic engineering technicians, the following conclusions were made:

1. The "*SCANS Skills*" are skills that are common or generic to many jobs or occupations in the workplace;
2. The "*SCANS Skills*" are not the skill standard (technical skills) of occupations in the workplace;
3. The "*SCANS Skills*" should be considered as core to the occupational curricula and should be prerequisite to the technical courses (Identified prerequisite skills in mathematics and communications for postsecondary technical/vocational programs previously identified are found in Figure 3 located at the end of this document.)
4. Technical instructors should require that the "*SCANS Skills*" are performed proficiently in learning/developing the skill standards of the workplace; and
5. Intensive staff development will be needed by curriculum developers, developers of instructional materials, and instructors if the SCANS Skills are to be included in the curriculum of all technical (occupational) preparation programs.

ENHANCEMENTS

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: Direct Current Circuits - EEC 1004
(Title and/number)

Unit: Unit 1: Laboratory Orientation - Lesson 1
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate knowledge of acquiring parts and equipment for assigned labs.**

Lesson Objective: **Given required materials and equipment list for lab exercise, gather necessary parts and equipment within given time limit at 100 %.**

Information: Interpret required materials and equipment list for assigned lab exercise. Demonstrate knowledge of lab layout and equipment locations.

Manipulative Skills: Gather required equipment and components when given materials list.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Walk students through lab and identify location of parts, equipment, and supplies
2. Demonstrate how to interpret lab materials and equipment list
3. Give each student materials list and allow for demonstration

Student Activities: (List)

1. Complete classroom exercises (problems)
2. Complete worksheets
3. Complete computer solutions
4. Complete Lab experiment
5. Written and performance evaluation

References: Textbook: ***Electronic Devices and Circuits*, Paynter,**
Lab Manual: ***Electronic Circuits Manual*, Paynter.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer and DVM, computer and required lab components).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Laboratory practical - oral questions and demonstration to 100 %.

(x) **Knowledge**
Written exam over unit to 70 %.

Course: Direct Current Circuits - EEC 1004
(Title and/number)

Unit: Unit 1: Laboratory Report Writing - Lesson 1
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate procedures and format of laboratory report.**

Lesson Objective: **Given technical data required, write a laboratory report in the proper format including required technical data 100 %.**

Information: Information provided in technical writing class
Technical information provided by instructor
Information from laboratory manual

Manipulative Skills: Generate laboratory report using word processing software.

SCANS: (List Scans competencies required/taught)

Resources: Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Information: Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems: Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Discuss organization of proper lab report:
   a. Purpose
   b. Procedure
   c. Technical Data
   d. Conclusion
2. Demonstrate how to record data
3. Demonstrate software necessary to prepare report
4. Evaluate

Student Activities: (List)

1. Attend classroom demonstration
2. Review example lab report
3. Using data provided, organize and list demonstrated format
4. Enter report into computer and generate example report to instructor's approval
5. Written and performance evaluation

References: Textbook: ***Electronic Devices and Circuits*, Paynter,**
Lab Manual: ***Electronic Circuits Manual*, Paynter.**
Computer based software - *Electronic Workbench*

Equipment/Supplies: a. Computer
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Completed computer generated laboratory report to 100 %.

(x) **Knowledge**
Written report based on structure and technical data

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: Semiconductors II/EEC - 1503
(Title and/number)

Unit: Unit 1: Junction Field-Effect Transistor - Lesson 1
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Upon completion of all theory classes, laboratory classes, and after working all examples and assigned problems, the student will explain all characteristics of JFETs, gate-to-source voltage requirements, drain current curves, transconductance curve, cutoff requirements, and JFET biasing.**

Lesson Objective:
1. Explain the structure and basic operation of the JFET.
2. Identify JFET symbols.
3. Explain JFET family of drain curves and pinch-off voltage, Vp.

Information:
Demonstrate an understanding of report writing for lab experiment.
Demonstrate an understanding of demonstration skills (teaching) in Lab experiment.
D.04: Demonstrate an understanding of field-effect transistors (JFETs).
D.12: Understand principles and operations of single-stage amplifiers.

Manipulative Skills:
Demonstrate ability to use equipment.
Demonstrate ability to prepare lab report of assigned laboratory experiment.
Demonstrate ability to explain techniques, procedures, formulas used in laboratory experiment in oral demonstration.
D.13: Fabricate and demonstrate single-stage amplifiers.
D.14: Troubleshoot and repair single-stage amplifier circuits.

SCANS: (List SCANS competencies required/taught)

Resources:	Allocates materials and facilities; allocates time.
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information.
Interpersonal:	Teaches others.
Systems:	Understands systems; monitors and corrects performance.

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises.	1. Complete assigned lab exercises as directed by instructor including manipulative skills activities listed above. (Report format and laboratory demonstration format from previous lesson.)
2. Conduct classroom lectures/discussions, provide demo labs, assign practice problems from textbook.	2. Attend scheduled lectures and participate in discussions, observe demo labs, complete practice problem assignments which demonstrate information requirement listed above.
3. Provide list of objectives to students.	3. Study list of objectives.
4. Conduct evaluations.	4. Complete evaluations.

References: Instructor-prepared handouts, student's list of objectives
Textbook: ***Introductory Electronic Devices and Circuits*** **by Robert Paynter.**
Lab Manual: ***Introductory Electronic Devices and Circuits Lab Manual***

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment.
b. Transparencies and overhead projector.

Evaluation: (x) Performance

Laboratory practical exam on JFETs to be completed in one hour.
Laboratory report evaluated per specifications.
Laboratory oral demonstration evaluated per specifications.

(x) Knowledge

Theory exam on objectives listed; 70 % passing.

Course: Semiconductors II/EEC - 1503
(Title and/number)

Unit: Unit 6: Operational Amplifiers - Lesson I
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Upon completion of all theory classes, laboratory classes, and after working all examples and assigned problems, the student will explain all characteristics of operational amplifiers, identify modes of operation of operational amplifiers, and describe various important uses of the operational amplifier.**

Lesson Objective: **Explain the structure and operation of the basic operational amplifier and the important characteristics of an op amp in one-hour lab at 100 %.**

Information: Demonstrate an understanding of report writing for lab experiment.
Demonstrate an understanding of demonstration skills in Lab experiment.
E.10: Understand principles and operations of operational amplifier circuits.
E.19: Understand principles and operations of active filter circuits.

Manipulative Skills: Demonstrate ability to use equipment, select materials and facilities for lab experiment.
Demonstrate ability to prepare report of assigned laboratory experiment.
Demonstrate ability to explain techniques, procedures, and results in oral demonstration.
D.13: Fabricate and demonstrate single-stage amplifiers
E.11: Fabricate and demonstrate operational amplifier circuits.
E.12: Troubleshoot and repair operational amplifier circuits.

SCANS: (List SCANS competencies required/taught)

Resources: Allocates materials and facilities, allocates time
Information: Acquires and evaluates information; organizes and maintains information; interprets and communicates information.
Interpersonal: Teaches others.
Systems: Understands systems; monitors and corrects performance.

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises.	1. Complete assigned lab exercises as directed by instructor including manipulative skills activities listed above. (Report format and laboratory demonstration format from previous lesson.)
2. Conduct classroom lectures/discussions, provide demo labs, assign practice problems from textbook.	2. Attend scheduled lectures and participate in discussions, observe demo labs, complete practice problem assignments which demonstrate information requirement listed above.
3. Provide list of objectives to students.	3. Study list of objectives.
4. Conduct evaluations.	4. Complete evaluations

References: Instructor-prepared handouts, student's list of objectives
Textbook: ***Introductory Electronic Devices and Circuits*** by Robert Paynter.
Lab Manual: ***Introductory Electronic Devices and Circuits Lab Manual***

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment.
b. Transparencies and overhead projector.

Evaluation: (x) Performance

Laboratory practical exam on Op-Amp operation to be completed in one hour.
Laboratory report evaluated per specifications.
Laboratory oral demonstration evaluated per specifications.

(x) Knowledge

Theory exam on objectives listed; 70 % passing.

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Course: **Semiconductors II/EEC - 1503**
(Title and/number)

Unit: **Unit 2: DE MOSPETS AND E MOSFETS - Lesson 1**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: Upon completion of all theory classes, laboratory classes, and after working all examples and assigned problems, the student will explain all characteristics of MOSFETs, identify symbols for the various types, describe the operational capabilities of each type in the various biasing methods, and identify important applications of MOSFETs to 100%.

Lesson Objective:

1. Explain the characteristics of the DE MOSFET
2. Identify the DE MOSFET symbols
3. Explain the terms depletion mode and enhancement mode in regards to the DE MOSFET
4. Explain the DE MOSFET transfer characteristic curve
5. Explain DE MOSFET biasing methods.

Information: Demonstrate an understanding of report writing for lab experiment.
Demonstrate an understanding of demonstration skills (teaching) in Lab experiment.
D.04: Demonstrate an understanding of field-effective transistors (FETs/MOSFETs).
D.12: Understand principles and operations of single-stage amplifiers.

Manipulative Skills: Demonstrate ability to use dual-channel oscilloscope, analog or digital multimeter, function generator, protoboard, DC power supply, operational amplifier, 741, resistors, marked R1 and R2.
Prepare lab report of assigned laboratory experiment.
Explain techniques, procedures, and equipment used in laboratory experiment in oral demonstration.
D.13: Fabricate and demonstrate single-stage amplifiers.
D.14: Troubleshoot and repair single-stage amplifiers.

SCANS: (List SCANS competencies required/taught)

Resources:	Allocates materials and facilities; allocates time.
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information.
Interpersonal:	Teaches others.
Systems:	Understands systems; monitors and corrects performance.

Teaching Methods:

Teacher Activities: (List)

1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises.
2. Conduct classroom lectures/discussions, provide demo labs, assign practice problems from textbook.
3. Provide list of objectives to students.
4. Conduct evaluations.

Student Activities: (List)

1. Complete assigned lab exercises as directed by instructor including manipulative skills activities listed above. (Report format and laboratory demonstration format from previous lesson.)
2. Attend scheduled lectures and participate in discussions, observe demo labs, complete practice problem assignments which demonstrate information requirement listed above.
3. Study list of objectives.
4. Complete evaluations.

References: Instructor-prepared handouts, student's list of objectives
Oral and written report Format: Teacher prepared/Lab Manual Report Format
Textbook: ***Introductory Electronic Devices and Circuits*** **by Robert Paynter.**
Lab Manual: ***Introductory Electronic Devices and Circuits Lab Manual***

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (dual-channel oscilloscope, analog digital multimeter, function generator, protoboard, DC power supply, operational amplifier, 741, resistors, marked R1 and R2.
b. Transparencies and overhead projector.

Evaluation: (x) Performance

Laboratory practical exam on MOSFET operation to be completed in one hour at 100%.
Laboratory report evaluated per specifications.
Laboratory oral demonstration evaluated per specifications.

(x) Knowledge

Theory exam on objectives listed; 70 % passing.

ELECTRONIC ENGINEERING TECHNICIANS CURRICULUM
Basic Course Outline

4-01-01

Course: DC Circuits I/EEC 1004 - Lesson 1
(Title and/number)

Unit: Unit 4: Series Circuits
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Upon completion of all theory classes, laboratory classes, and after working all examples and assigned problems, the student will define Ohm's Law and use it to solve for resistance, current, and voltage at 100%.**

Lesson Objective:

1. Calculate the current in a series circuit given resistance and applied voltage.
2. Explain the relationship between resistance, current flow and voltage drops in an electric circuit.
3. Calculate the amount of resistance necessary to drop a voltage to a desired level.
4. Manipulate equations and solve problems using Ohm's Law.
5. Determine and use the proper prefixes associated with electronic terms.

Information: Demonstrate an understanding of report writing for lab experiment.
Demonstrate an understanding of demonstration skills (teaching) in lab assignment.
B.04: Demonstrate an understanding of the meaning of and relationships among and between voltage, current, resistance, power and energy in DC circuits.
B.06: Demonstrate an understanding of the application of Ohm's Law to series circuits.

Manipulative Skills: Use of Ohmmeter, voltmeter, ammeter, power supply, connecting leads, and circuit boards as learned in previous lesson.
Prepare lab report of assigned laboratory experiment.
Explain techniques, procedures and equipment used in laboratory experiment.
B.11: Fabricate and demonstrate DC series circuit.
B.12: Troubleshoot and repair DC series circuit.

SCANS: (List SCANS competencies required/taught)
Resources: Allocates materials and facilities; allocates time.
Information: Acquires and evaluates information; organizes and maintains information; interprets and communicates information.
Interpersonal: Teaches others.
Systems: Understands systems; monitors and corrects performance.

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises: Using Ohm's Law - a. Draw schematic of series circuit; b. Calculate voltage from resistance and current; c. Calculate current from resistance and voltage; d. Calculate resistance from current voltage; e. Prepare evaluation and test. f. Test	1. Complete assigned lab exercises as directed by instructor including manipulative skills activities listed above. (Report format attached and laboratory demonstration format from previous lesson.)
2. Conduct classroom lectures/discussions, provide demo labs, assign practice problems from textbook.	2. Attend scheduled lectures and participate in discussions, observe demo labs, complete practice problem assignments which demonstrate information requirement listed above.
3. Provide list of objectives to students.	3. Study list of objectives.
4. Conduct evaluations.	4. Complete evaluations

References: Instructor-prepared handouts, student's list of objectives
Textbook: ***Introductory Electronic Devices and Circuits*** **by Robert Paynter.**
Lab Manual: ***Introductory Electronic Devices and Circuits Lab Manual***
Oral and written report Format: Teacher prepared/Lab Manual Report Format.

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment. (Resistors, meter, blend board, Jumper wire, ohmmeter, voltmeter, ammeter, power supply, connecting leads, circuit board)
b. Transparencies and overhead projector.

Evaluation: **(x) Performance**

Laboratory practical exam on Ohm's Law to solve for resistance, current, and voltage to be completed in one hour. (Draw series circuit; build series circuit; measure resistance, voltage, current; analyze series circuit using Ohm's Law.)
Laboratory report evaluated per specifications.
Laboratory oral demonstration evaluated per specifications.

(x) Knowledge

Theory exam on objectives listed; 70 % passing.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: AC Circuits - EEC 1104
(Title and/number)

Unit: Unit 2: Capacitive Circuits - Lesson 1
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Upon completion of all theory classes, laboratory classes, and after working all examples and assigned problems, the student will understand Principles and Operations of AC Capacitive Circuits**

Lesson Objective: **Calculate total reactance for Series Circuits in one hour to 100 %.**

Information: Demonstrate an understanding of report writing for lab experiment.
Demonstrate an understanding of oral reporting for demonstration.
Demonstrate an understanding of how to solve for circuit values (voltage, reactance capacitance, current).
C.04: Demonstrate an understanding of measurement of power in AC circuits.
C.07: Demonstrate an understanding of the principles and operations of AC capacitive circuits.

Manipulative Skills: Demonstrate ability to use equipment.
Demonstrate ability to prepare lab report of assigned laboratory experiment.
Demonstrate ability to explain techniques, procedures, formulas used in laboratory experiment in oral demonstration.
C.08: Fabricate and demonstrate AC capacitive circuits.
C.09: Troubleshoot and repair AC capacitive circuits.

SCANS: (List SCANS competencies required/taught)

Resources:	Allocates materials and facilities; allocates time.
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information.
Interpersonal:	Teaches others; works with others.
Systems:	Understands systems; monitors/corrects performance; improves

Teaching Methods:

Teacher Activities: (List)

1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises:
    a. Demonstrate on board how reactance is calculated
    b. Explain function of capacitor and current;
    c. Demonstrate lab exercise and
2. Prepare evaluation and test.
3. Provide list of objectives to students.
4. Conduct evaluations.

Student Activities: (List)

1. Complete assigned lab exercises as directed by instructor including manipulative skills activities listed above. (Report format attached and laboratory demonstration format from previous lesson.)
    a. Work problems solving for Xc
    b. Given different variables solve for Xc
2. Attend scheduled lectures and participate in discussions, observe demo labs, complete practice problem assignments which demonstrate information requirement listed above.
3. Study list of objectives.
4. Complete evaluations

References: Instructor-prepared handouts, student's list of objectives
Textbook: ***Basic Electronics*, B. Grob, Seventh Edition**
Lab Manual: ***Basic Electronics Lab Manual*, B. Grob.**
Oral and written report Format: Teacher prepared/Lab Manual Report Format.

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Audio signal generator, Oscilloscope, Basic trainer).
b. Transparencies and overhead projector.

Evaluation: **(x) Performance**

Laboratory practical exam on Series Capacitive Circuits by constructing series capacitive circuits and confirming calculations by taking circuit measurements in on hour to 100%.
Laboratory report evaluated per specifications.
Laboratory oral demonstration evaluated per specifications.

(x) Knowledge

Written exam over unit to 70 %.

Course: AC CIRCUITS - EEC 1104 - Unit 2
(Title and/number)

Unit: Unit 2: Inductive Circuits - Lesson 4
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Understand principles and operations of AC Inductive Circuits. (C.08)**

Lesson Objective: **Calculate and prove total inductive reactance in Parallel Circuits in one hour at 100%.**

Information: Solve for circuit values in an AC inductive parallel circuit (voltage, current inductive reactance).

Manipulative Skills: Construct parallel inductive circuits and confirm calculations by taking circuit measurements.

SCANS: (List SCANS competencies required/taught)

Resources: Allocates materials and facilities;
Information: Acquires and evaluates information; interprets information: uses computer to process information;

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Assign exercises from lab manual supplemented by instructor-prepared lab exercises: a. Using board and overhead, explain how Xl is calculated. b. Solve several examples calculating Xl. c. Demonstrate Lab exercise and	1. Identify electronic lab locations of parts supplies and equipment.
2. Prepare evaluation and test.	2. Gather required materials from list contained in lab exercises.
3. Provide list of objectives to students.	3. List procedures for gathering materials
4. Conduct evaluations.	4. Written and performance evaluation

References: Instructor-prepared handouts, student's list of objectives
Textbook: ***Basic Electronics*, B. Grob, Seventh Edition**
Lab Manual: ***Basic Electronics Lab Manual*, B. Grob.**
Oral and written report Format: Teacher prepared/Lab Manual Report Format.
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer, computer).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Laboratory practical exam of lab exercise to 100 %.

(x) **Knowledge**
Written exam over unit to 70 %.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: Direct Current Circuits - EEC 1004
(Title and/number)

Unit: Unit 4: Series Circuits - Lesson 1
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: Demonstrate an understanding of Ohm's Law to Series Circuits (B.06)

Lesson Objective: Given necessary equipment and information, calculate the current in a series circuit given resistance and applied voltage to 100%.

Information: Demonstrate understanding in the use of Ohm's Law and the manipulation of the formula to acquire current when given voltage and resistance.

Manipulative Skills: Construct and analyze series circuit using Computer Assisted I software to 100 %.

SCANS: (List SCANS competencies required/taught)

Information: Uses computers to process information.
Systems: Understands systems; monitors and corrects performance.

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Review of Ohm's Law	1. Use calculator to solve problems
2. Demonstrate manipulation of V = IR	2. Identify circuit components
3. Demonstrate circuit simulation on computer	3. Use Computer Assisted I Software
	4. Written and performance evaluation

References: Textbook: ***Basic Electronics*, B. Grob, Seventh Edition**
Lab Manual: ***Basic Electronics Lab Manual*, B. Grob.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer, computer).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Demonstration of circuit analysis on computer to 100 %.
(x) **Knowledge**
Written exam over unit to 70 %.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: **Direct Current Circuits - EEC 1004**
(Title and/number)

Unit: **Sources of Electricity - Unit 1 - Lesson 1 - (B.02)**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: Demonstrate generation of Electricity with Light

Lesson Objective: Calculate parameters of photovoltaic cells then construct circuit using photocell in laboratory setting in one hour at 100 %.

Information: Using Ohm's Law, calculate voltage and current in a given circuit when resistance is known.

Manipulative Skills: Construct series circuit and complete required measurements when a photocell is used as the source.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain basic operation and construction of photovoltaic cell
2. Demonstrate analysis of circuit when photocell is used as source
3. Evaluation

Student Activities: (List)

1. Complete student worksheet
2. Complete photocell lab
3. Written and performance evaluation

References: Textbook: ***Basic Electronics*, B. Grob, Seventh Edition**
Lab Manual: ***Basic Electronics Lab Manual*, B. Grob.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer, computer).
b. Transparencies and overhead projector.

Evaluation: **(x) Performance**
Laboratory practical - oral questions and demonstration to 100 %.
(x) Knowledge
Written exam over unit to 70 %.

Course: Direct Current Circuits - EEC 1004
(Title and/number)

Unit: Unit 7: Series-Parallel Circuits - Lesson 1 - (B.17)
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of series-parallel circuits.**

Lesson Objective: **Given the necessary components and laboratory test equipment, measure the voltage, current and resistance values in a series-parallel circuit to verify calculated values previously determined to 100%.**

Information: Identify series-parallel circuits, how to simplify them, and how to calculate total resistance, total current and voltage distribution in a series-parallel network.

Manipulative Skills: Construct series-parallel circuit and measure resistance and operating current and voltage values using the appropriate instrumentation.

SCANS: (List Scans competencies required/taught)

Resources: Prepares and follows schedules
Interpersonal: Participates as member of team;
Information: Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems: Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain and demonstrate series-parallel circuit characteristics.
2. Explain calculation methodology using several example circuits.
3. Demonstrate circuit solutions using computer software.
4. Demonstrate Lab exercise.
5. Explain written report criteria and assists as necessary.
6. Evaluates student performance using written and lab evaluations.

Student Activities: (List)

1. Complete student worksheets and software exercises.
2. Complete solutions to computer generated review problems.
3. Completes lab experiment.
4. Writes report on lab project which is graded by instructor for processes and the English Department for grammar and punctuation.
5. Completes written and performance evaluations.

References: Textbook: ***Basic Electronics*, B. Grob, Seventh Edition**
Lab Manual: ***Basic Electronics Lab Manual*, B. Grob.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:

a. Test equipment and electronic components as listed in lab experiment (Circuitboard, DC Power Supply, Voltmeter, Ammeter & Ohmmeter).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**

Laboratory practical - oral questions and demonstration to 100 %.

(x) **Knowledge**

Written exam over unit to 75%.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

4-05-01

Course: Semiconductors I - EEC 1404
(Title and/number)

Unit: Unit 4: Transistor Characteristics - Lesson 5 (D.02)
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of Bipolar transistors**

Lesson Objective: **Given laboratory test equipment, measure biasing currents and voltages of bipolar transistors in the common-emitter, common-collector, and common-base configurations within 10 % of the calculated values.**

Information: Identify three basic transistor configurations, common-base, common-collector and common-emitter and explain their differences and similarities.

Manipulative Skills: Construct common base, emitter, and collector circuits and provide the proper bias for operation.
Simulate circuit operation using computer based software.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain and demonstrate three transistor configurations	1. Complete classroom exercises (problems)
2. Example calculations using several problems	2. Complete worksheets
3. Demonstrate software application	3. Complete computer solutions
4. Demonstrate lab exercise	4. Complete Lab experiment
5. Evaluation	5. Written and performance evaluation

References: Textbook: ***Electronic Devices and Circuits*, Paynter,**
Lab Manual: ***Electronic Devices and Circuits Manual*, Paynter.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer and DVM, computer and required lab components).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance:** Laboratory practical - oral questions and demonstration to 100 %.
(x) **Knowledge:** Written exam over unit to 70 %.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: **Semiconductors I - EEC 1404**
(Title and/number)

Unit: **Unit 1: Power Supplies - Lesson 1(E.07)**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Understand principles and operations of linear power supplies and filters.**

Lesson Objective: **Given all equipment and information, explain the operation of the Half Wave Rectifier to 100%.**

Information: Using Ohm's Law and basic diode principles explain the operation of a half wave rectifier (both positive and negative).

Manipulative Skills: Construct positive power supply with a half wave rectifier and prove theory component of lesson by circuit measurements.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain and demonstrate half wave rectifiers	1. Complete classroom exercises (problems)
2. Prepare student worksheets	2. Complete worksheets
3. Demonstrate software application	3. Complete computer solutions
4. Demonstrate lab exercise	4. Complete Lab experiment
5. Evaluation	5. Written and performance evaluation

References: Textbook: ***Electronic Devices and Circuits*, Paynter,**
Lab Manual: ***Electronic Circuits Manual*, Paynter.**
Computer based software - *Electronic Workbench*

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Oscilloscope, Basic trainer and DVM, computer and required lab components).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Laboratory practical - oral questions and demonstration to 100 %.
(x) **Knowledge**
Written exam over unit to 70 %.

Course: Digital Electronics - EEC 1203
(Title and/number)

Unit: Unit 2: Logic Gates - Lesson 2 (F.07)
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate truths and functions of Logic Gates**

Lesson Objective: **Upon completion of classroom lecture and laboratory demonstration, the student will draw logic symbol and state the truth table for "AND", "OR", "NAND", "NOR", "NOT", "EX-OR", "EX-NOR" Gates to 100 %.**

Information: Truth tables of the functions of "AND", "OR", "NAND", "NOR", "NOT", "EX-OR", "EX-NOR" Logic gates.

Manipulative Skills: Construct and analyze simple logic circuits using "AND", "OR", "NAND", "NOR", "NOT", "EX-OR", "EX-NOR" Logic gates.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Draw each logic gate symbol and list truth tables for each	1. Complete classroom exercises (problems)
2. Explain logic function	2. Complete worksheets
3. Check student laboratory work	3. Complete Logic Gate Lab work
4. Prepare written and oral questions	5. Written and performance evaluation

References:
Textbook: *Digital Fundamentals*, Floyd,
Lab Manual: *Digital Experiments*, Cox.
TTL Data Book - Texas Instruments

Equipment/Supplies:
a. Test equipment and electronic components as listed in lab experiment (Digital trainer, Logic Gate I.C. Chips, Logic probe or oscope).
b. Transparencies and overhead projector.

Evaluation: (x) **Performance**
Laboratory practical - oral questions and demonstration to 100 %.
(x) **Knowledge**
Written exam over unit to 70 %.

Course: Microprocessors - EEC 1603
(Title and/number)

Unit: **Unit 1: Introduction to Microprocessors - Lesson 1 - EIF Skill Standard G.03**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of Microprocessors Architecture and Processes.**

Lesson Objective: **Given necessary equipment and supplies, the student will define basic microprocessor architecture with 90% accuracy.**

Information: Identify and Explain basic microprocessor concepts:

1. Decimal and binary numbering systems;
2. Processor Arithmetic;
3. Basic Microprocessor Architectural Concepts.

Manipulative Skills: Demonstrate ability to explain the Basic Operation of Microprocessors.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules;
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain the basic microprocessor concepts.
2. Explain Processor Arithmetic.
3. Explain basic microprocessor architectural concepts.
4. Evaluation.

Student Activities: (List)

1. Complete classroom exercises (problems) (Pages 1 - 15).
2. View video tape, "Microprocessors" # MP-1 (pages 16 - 48).
3. View video tape,"microcomputer Basics" # MP-2 (pages 49 - 70).
4. View video tape, "Computer Math" # MP-3.
5. Written evaluation RO-1.

References: Textbook: *Microprocessors: Principles and Applications*, **Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor

Evaluation: ( ) **Performance**

(x) **Knowledge**
Written exam over unit to 90 %.

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Course: Microprocessors - EEC 1603
(Title and/number)

Unit: Unit 2: Internal Operations of Microprocessors - Week 2 EIF Skill Standard G.04, G.05
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of Microprocessor Operation and Instructions.**

Lesson Objective: **Given necessary equipment and supplies, the student will demonstrate a working knowledge of microprocessor operations in a laboratory setting to 100%.**

Information: Identify and Explain basic microprocessor internal components and operations.

Manipulative Skills: Demonstrate ability to explain the Basic Operation of Microprocessors.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules:
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain internal areas of microprocessor.
2. Explain microprocessor instructions.
3. Explain basic microprocessor architectural concepts.
4. Demonstrate lab exercise.
5. Evaluation.

Student Activities: (List)

1. Complete classroom exercises (problems) (Pages 71 - 101).
2. Complete laboratory exercise Lab 1. (pages 102 - 126).
3. View video tape,"Microcomputer Basics" # MP-2 (pages 49 - 70).
4. Written evaluation RO-2.

References: Textbook: *Microprocessors: Principles and Applications*, **Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**

(x) **Knowledge** - Written exam over unit to 90 %.

Course: Microprocessors - EEC 1603
(Title and/number)

Unit: Unit 3: Introduction to Programming - Week 3 - EIF Skill Standard G.08
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of the principles and operations of Microprocessor machine code and instruction sets.**

Lesson Objective: **Given necessary equipment and supplies, the student will demonstrate a working knowledge of microprocessor operations using machine code and instruction sets in a laboratory setting to 100%.**

Information: Demonstrate and explain basic microprocessor programming techniques.
Demonstrate and explain Operating Systems and System software.

Manipulative Skills: Demonstrate ability to explain the Basic Microprocessor programming.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources: Prepares and follows schedules;
Interpersonal: Participates as member of team;
Information: Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems: Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain microprocessor programming. (pages 382 - 410)
2. Explain microprocessor operating systems and system software (pages 411 - 439)
3. Demonstrate lab exercise. (Lab 2)
4. Evaluation.

Student Activities: (List)

1. Complete classroom exercises (problems)
2. View video tape, "Intro to Computer Programming System Software"
3. View video tape,"Programming, MP-4.
4. View video tape, "Introduction to Programming Algorithms" # MP-5.
5. View video tape, "IBM PC - Introduction to DOS".
6. Complete lab Experiment (Lab 2)
7. Written evaluation RO-2.

References: Textbook: ***Microprocessors: Principles and Applications*, Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor
c. Microprocessor Trainer ET-6800
d. IBM PC Compatible computer

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**
(x) **Knowledge - Written exam over unit to 90 %.**

Course: Microprocessors - EEC 1603
(Title and/number)

Unit: Unit 4: Communicating with the Microprocessor - Week 4 - 6 - EIF Skill Standard G.01
Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate the principles of communicating with the Microprocessor.**

Lesson Objective: **Given necessary equipment and supplies, the student will demonstrate a working knowledge of communicating with the microprocessor in a laboratory setting to 100%.**

Information: Demonstrate and explain communication with the microprocessor.

Manipulative Skills: Demonstrate ability to communicate with the microprocessor.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules;
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Explain microprocessor communications (pages 382 - 410).
2. Explain two 8 bit microprocessors systems software (pages 140 - 186).
3. Demonstrate lab exercise. (Lab 3).
4. Demonstrate lab exercise. (Lab 4).
5. Demonstrate lab exercise. (Lab 5).
6. Evaluation.

Student Activities: (List)

1. Complete classroom exercises (problems)
2. View video tape, "Stack Operations" #MP-6.
3. View video tape,"Stack Operations" #MP-7.
4. View video tape, "I/O Operations" #MP-8.
5. Complete lab Experiments (Lab 3, 4, 5)
7. Written evaluation RO-4.

References: Textbook: ***Microprocessors: Principles and Applications*, Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor
c. Microprocessor Trainer ET-6800
d. IBM PC Compatible computer

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**
(x) **Knowledge - Written exam over unit to 90 %.**

Course: Microprocessors - EEC 1603
(Title and/number)

Unit: Unit 7: Types of Microprocessors - Week 7 - 8 - EIF Skill Standard G.04, G.05
Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of 8 and 16 bit Microprocessors.**

Lesson Objective: **Given necessary equipment and supplies, the student will demonstrate a working knowledge of 8 and 16 bit microprocessors in a laboratory setting to 100%.**

Information: Demonstrate and explain the differences and commonalities of 8 and 16 bit microprocessors.

Manipulative Skills: Demonstrate ability to distinguish between 8 and 16 bit microprocessors.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules;
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain single chip 8 bit microprocessors (Pages 187 - 223).	1. Complete classroom exercises (problems)
2. Explain 16 bit microprocessors systems software (pages 224 - 282).	2. View video tape, "Microcomputers Explained"
3. Demonstrate lab exercise. (Lab 6).	3. Complete Lab Experiments (Lab 6, 7)
4. Demonstrate lab exercise. (Lab 7).	4. Written evaluation RO-4.
5. Evaluation.	

References: Textbook: ***Microprocessors: Principles and Applications*, Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor
c. Microprocessor Trainer ET-6800
d. IBM PC Compatible computer

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**
(x) **Knowledge - Written exam over unit to 90 %.**

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ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM

Basic Course Outline

9-09-10-01

Course: Microprocessors - EEC 1603
(Title and/number)

Unit: Unit 9: Types of Microprocessors Memory Circuits - Week 9 -10 - EIF Skill Standard G.06
Name and/or Number of instructional unit (division) of the course)

Unit Objective: Demonstrate an understanding of Microprocessor Memory Circuits.

Lesson Objective: Given necessary equipment and supplies, the student will demonstrate a working knowledge of microprocessor memory circuits in a laboratory setting to 100%.

Information: Demonstrate and explain microprocessor memory circuits and devices.

Manipulative Skills: Demonstrate understanding of the principles and operations of microprocessors memory circuits.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules;
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain microprocessor memory (Pages 283 - 310).	1. Complete classroom exercises (problems)
2. Explain mass storage (pages 311 - 339).	2. Explain mass storage.
3. Explain microprocessor I/O. (pages 340 - 381)	3. Complete laboratory experiment.
4. Evaluation.	4. Written evaluation RO-6.

References: Textbook: ***Microprocessors: Principles and Applications*, Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor
c. Microprocessor Trainer ET-6800
d. IBM PC Compatible computer

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**
(x) **Knowledge - Written exam over unit to 90 %.**

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM

10-10-01

Basic Course Outline

Course: **Microprocessors - EEC 1603**
(Title and/number)

Unit: **Unit 10: Troubleshoot microprocessor circuits - Week 10 - EIF Skill Standard G.02, G.07.**
Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Demonstrate an understanding of troubleshooting Microprocessor circuits.**

Lesson Objective: **Given necessary equipment and supplies, the student will demonstrate a working knowledge of troubleshooting microprocessor circuits in a laboratory setting to 100%.**

Information: Demonstrate and explain troubleshooting microprocessor circuits.

Manipulative Skills: Demonstrate the ability to troubleshoot microprocessor circuits.
Demonstrate ability to write report for lab experiment.
Demonstrate ability to present oral report for demonstrations.

SCANS: (List Scans competencies required/taught)

Resources:	Prepares and follows schedules;
Interpersonal:	Participates as member of team;
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain microprocessor servicing (pages 440 - 462).	1. Complete classroom exercises (problems)
2. Explain development of troubleshooting techniques for microprocessors (pages 463 - 490).	2. View video tape, "Troubleshooting the Microprocessor".
3. Evaluation.	3. Complete laboratory experiment.
	4. Written evaluation RO-7.

References: Textbook: ***Microprocessors: Principles and Applications*, Gilmore, McGraw Hill Publications**

Equipment/Supplies:
a. Transparencies and overhead projector.
b. Video Player and Monitor
c. Microprocessor Trainer ET-6800
d. IBM PC Compatible computer

Evaluation: (x) **Performance - Laboratory demonstration to 100%.**
(x) **Knowledge - Written exam over unit to 90 %.**

ELECTRONIC ENGINEERING TECHNICIAN ENHANCEMENT (JEP)
Basic Course Outline

Course: **Structure of Writing**
(Title and/number)

Unit: **Unit IX: Lesson 2 - Mechanics of Writing**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: Edit Documents

Lesson Objective: The learner will edit a workplace document for capitalization to 70 %.

Information: Brainstorm known capitalization rules.
Using reference resources, expand "known" list of capitalization rules.

Manipulative Skills: Apply capitalization rules to workplace sentences.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team; teaches others
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Facilitate student activities	1. Brainstorm rules for capitalization
2. Prepare job document	2. Highlight capitalization on workplace documents
3. Evaluate	3. Use reference resource to complete rule list
	4. Peer teach
	5. Edit workplace sentences

References: Assorted writing texts
Workplace documents
Dictionaries

Equipment/Supplies: Flip charts
Transparencies
Overhead projector
Transparencies

Evaluation: (x) **Performance**
(x) **Knowledge**

Edit workplace documents for capitalization with 70 % accuracy.

ELECTRONIC ENGINEERING TECHNICIAN ENHANCEMENT (JEP)
Basic Course Outline

Course: Communications
(Title and/number)

Unit: Lesson 2A - Presentations
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Effective oral communications in workplace.**

Lesson Objective: **The learner will understand the importance of pre-planning a presentation.**

Information: Background information on four steps to creating a presentation
Brainstorm percent of time spent on each step in creating presentation.

Manipulative Skills: Apply pre-planning rules to workplace presentation.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team; teaches others
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Facilitate student activities
2. Prepare example presentation documents
3. Evaluate

Student Activities: (List)

1. Brainstorm rules for creating a presentation
2. Highlight percent of time each of the four steps in presentation would/should take
3. Use reference resource to identify importance of good presentation skills
4. Peer teach
5. Complete pre-planning for workplace presentation

References: Assorted writing texts
Workplace documents
Dictionaries

Equipment/Supplies: Flip charts
Transparencies
Overhead projector
Transparencies

Evaluation: **(x) Performance**
(x) Knowledge

Complete pre-planning for workplace presentation with 70 % accuracy.

ELECTRONIC ENGINEERING TECHNICIAN ENHANCEMENT (JEP)
Basic Course Outline

Course: **Communications**
(Title and/number)

Unit: **Lesson 2B - Presentations**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Effective oral communications in workplace.**

Lesson Objective: **The learner will understand the different presentation purposes.**

Information: Background information on four steps to creating a presentation
Brainstorm what types of presentations there are and the reasons for each (to inform, to inspire, to praise, to persuade, to instruct, etc.)

Manipulative Skills: Apply pre-planning step to workplace presentation for specific purpose.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team; teaches others
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Facilitate student activities
2. Prepare example presentation documents
3. Evaluate

Student Activities: (List)

1. Brainstorm types of presentations and the purposes for each
2. Participate in the development of a presentation on Cycle Time with class members
3. Use reference resource to identify types/purposes of presentations
4. Peer teach
5. Complete pre-planning for workplace presentation for a specific purpose

References: Assorted writing texts
Workplace documents
Dictionaries

Equipment/Supplies: Flip charts, Transparencies, Overhead projector, Transparencies

Evaluation: (x) **Performance**
(x) **Knowledge**
Complete pre-planning for workplace presentation on Cycle Time with 70 % accuracy.

ELECTRONIC ENGINEERING TECHNICIAN ENHANCEMENT (JEP)
Basic Course Outline

Course: **Communications**
(Title and/number)

Unit: **Lesson 2C - Presentations**
(Name and/or Number of instructional unit (division) of the course)

Unit Objective: **Effective oral communications in workplace.**

Lesson Objective: **The learner will identify the needs of the audience members.**

Information: Background information on four steps to creating a presentation
Brainstorm what types of presentations there are and the reasons for each (to inform, to inspire, to praise, to persuade, to instruct, etc.)
Brainstorm types of things a presenter needs to know about the audience

Manipulative Skills: Apply pre-planning step to workplace presentation for specific purpose based on audience needs.

SCANS: (List Scans competencies required/taught)

Resources:	Material and Facilities: uses materials or space efficiently; Prepares and follows schedules
Interpersonal:	Participates as member of team; teaches others
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)

1. Facilitate student activities
2. Prepare example presentation documents
3. Evaluate

Student Activities: (List)

1. Brainstorm types of information a presenter needs to know about the audience
2. Participate in discussion on how a presentation on Cycle Time might be different for different audiences
3. Collect information and make a master list of audience needs
4. Peer teach
5. Complete pre-planning for workplace presentation for a specific purpose with identified audience needs

References: Assorted writing texts, Workplace documents, Dictionaries

Equipment/Supplies: Flip charts, Transparencies, Overhead projector, Transparencies

Evaluation: (x) **Performance**
(x) **Knowledge**
Complete pre-planning for workplace presentation on Cycle Time including audience needs with 70 % accuracy.

STUDENT ACTIVITY SHEET FOR THE
APPLICATION OF READING
(Skill/Competency)

Academic skill (competency, objective, outcome) to be attained by student:

Identifying Main Ideas in Paragraphs

Application of: **Identifying the Main Idea** **in** **Computer Science**
Occupational Skill (Task) — Name of Technical/Vocational Curriculum

Purpose - Application of Skill: Identifying the main idea of a paragraph in a textbook or resource manual

Application Activity - Problem:

The paragraphs below come from college texts. After you read each selection, try to determine the main idea. Then, from the choices given, put a checkmark next to the statement that best states the main idea. Remember: some main ideas are stated; others are only implied.

3. Computer Science

An analyst for the firm can use the memory and the calculating ability of her personal computer to track the prices of stocks and bonds, but the most import function of her computer is to communicate her ideas to others. It helps her communicate in three ways. First, the analyst constructs graphs of stock and bond prices versus time in three colors on the screen of her computer. If she had to do this by hand, it would never get done. Second, she uses the computer to write a report, incorporate the graphs into the report, and then check her spelling. Finally, she sends a copy of the report to 250 clients. For some of these customers the postal service is too slow; so the analyst . . . sends the text and graphics over the telephone the same evening by using her personal computer, a telephone connection, and a program that runs her computer automatically in her absence.

—Sullivan, Lewis and Cook

_____ a. Computers are better at business than human beings.

_____ b. Most of the work an analyst does can't be done by machine.

_____ c. Computers serve a variety of useful and time-saving functions.

_____ d. Computers aren't as important to Americans as telephones.

STUDENT ACTIVITY SHEET FOR THE APPLICATION OF SKILL
(Competency)

Academic Skill (competency, objective, outcome) to be attained by student:

Solving problems using linear equations

Application to: Preparing drugs for Administration of NURSING
Occupational Skill (Task) Name of Technical/Vocational Curriculum

Purpose - Application of skill:

There are times when nurses must change the concentration of a drug before it is administered. They must be able to determine the concentration using one variable. The skill of using linear equations will assist the nurse in making the appropriate change in the concentration of the drug.

Instructional Objectives:

Following instructions, using pencil and paper, and given an assigned problem, students will demonstrate their ability to solve problems using a linear equation with one variable. Each student will demonstrate their ability at 100 percent accuracy within five minutes.

Application Activity - Problem

A coronary drug must be administered to a patient in an 8 % concentration. The hospital buys the drug from a pharmaceutical company that sell it only in concentrations of 20 % (milligrams [mg] per milliter [ml]).

How many milliters of pure water must be mixed with 1200 mg. (=1.2g) of the drug to obtain an 8 % concentration?

Write the equation (procedure) you used in determining the number of ml of pure water needed to achieve the 8 % concentration.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: **AC Circuits-ELES1302**
(Title and/number)

Unit: **Unit 2: AC Capacitive Circuits-Lesson 5 (2.E)**
Name and/or Number of instructional unit (division of the course)

Unit Objective: **Fabricate and demonstrate AC capacitive circuits**

Instructional Objective: Given laboratory test equipment measure voltage and current, determine the phase relationship between voltage and current, and evaluate power in AC capacitive circuits.

Information: Manipulate capacitive circuits and equations and solve problems associated with capacitive circuits.

Manipulative Skills: Construct AC capacitive circuits. Utilize oscilloscope to prove phase relationship between voltage and current.

SCANS:

Resources	Material and Facilities: Uses materials or space efficiently; Prepares and follows schedules
Information	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems	Understands Systems; monitors and corrects performance

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1 Explain and demonstrate capacitive circuits	1 Complete classroom exercises
2 Demonstrate lab exercises	2. Complete worksheets
3 Evaluation	3. Complete Lab Experiment
	4. Written and performance evaluation

References: Textbook: **AC Electronics, Michalski**
Lab Manual: **AC Electronics, Michalski**

Equipment/Supplies:
a Test equipment and electronic components as listed in lab experiment (oscilloscope, basic trainer, DMM, and required lab components).
b Transparencies and overhead projector

Evaluation: **Performance:** Laboratory practical- oral questions and demonstration to 100%
(Program Profile # 100, 101, and 103)

Knowledge: Written exam over unit to 70%.

ELECTRONIC ENGINEERING TECHNICIAN CURRICULUM
Basic Course Outline

Course: **AC Circuits-ELES1302**
(Title and/number)

Unit: **Unit 2: AC Capacitive Circuits-Lesson 6 (2.b)**
Name and/or Number of instructional unit (division of the course)

Unit Objective: **Troubleshoot and repair AC capacitive circuits**

Instructional Objective: Given laboratory test equipment check capacitors for leakage or shorts. After determination of faulty capacitor (s) replace and confirm proper operation.

Information: Test AC and DC capacitive circuits to determine faulty capacitor (s).

Manipulative Skills: Take voltage measurement and ohmic measurements with a DMM. Observe and evaluate oscilloscope measurements. Evaluate capacitors with assistance of capacitor tester.

SCANS:

Resources:	Material and Facilities: Uses materials or space efficiently; Prepares and follows schedules
Information:	Acquires and evaluates information; organizes and maintains information; interprets and communicates information
Systems:	Understands Systems; monitors and corrects performance
Technology:	Selects technology, Applies technology to task, maintains and troubleshoots technology
Thinking Skills:	Makes decisions, solves problems, knows how to learn, reasons

Teaching Methods:

Teacher Activities: (List)	**Student Activities:** (List)
1. Explain and demonstrate capacitive circuits	1. Complete classroom exercises
2. Demonstrate lab exercises	2. Complete worksheets
3. Evaluation	3. Complete Lab Experiment
	4. Written and performance evaluation

References: Textbook: **AC Electronics, Michalski**
Lab Manual: **AC Electronics, Michalski**

Equipment/Supplies: a. Test equipment and electronic components as listed in lab experiment (oscilloscope, basic trainer, DMM, and required lab components).
b. Transparencies and overhead projector

Evaluation: **Performance:** Laboratory practical- oral questions and demonstration to 100%
(Program Profile # 100, 101, and 103)

Knowledge: Written exam over unit to 70%.

COMPETENCY PROFILE
FOR
ELECTRONIC SERVICING

Student Name______________________________ Date______________________

****

RATING SCALE:

4 SKILLED..............Can work independently with no supervision
3 MODERATELY SKILLED...Can perform job completely with limited supervision
2 LIMITED SKILL........Requires instruction and close supervision
1 NO EXPOSURE..........No experience or knowledge in this area

****

COMPETENCY

4	3	2	1	
				(1) Name three major applications of television.
				(2) Draw the block diagram of a monochrome television receiver.
				(3) Label all the blocks on the block diagram of a monochrome television receiver.
				(4) Name the circuits that process the video signals in a monochrome television receiver.
				(5) Name the circuits that process the audio signals in a monochrome television receiver.
				(6) Name the seven steps for successful troubleshooting.
				(7) Describe the details of a visual inspection on a monochrome television receiver.
				(8) Demonstrate the correct procedures for testing active components in a television receiver.
				(9) Demonstrate the correct procedures for taking voltage measurements in a television receiver.
				(10) Demonstrate the correct procedures for measuring resistance in a television receiver.
				(11) Demonstrate the correct procedures for tracing a signal within a television receiver.
				(12) Demonstrate the correct procedures for injecting signals into a television receiver.
				(13) Describe the basic construction of integrated circuits.
				(14) Explain the basic uses of integrated circuits in television receivers.
				(15) Define video receiver subsystems and explain how video receiver subsystems process signals.

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4	3	2	1	
				(16) Demonstrate correct procedures for troubleshooting video subsystems within a television receiver.
				(17) Name the audio subsystem stages found in a television receiver.
				(18) Demonstrate correct procedures for troubleshooting audio subsystems within a television receiver.
				(19) Describe the function of a television receiver's vertical deflection circuits.
				(20) Describe the function of a television receiver's horizontal deflection circuits.
				(21) Demonstrate correct procedures for troubleshooting television vertical deflection circuits.
				(22) Demonstrate correct procedures for troubleshooting television horizontal deflection circuits.
				(23) Name the basic circuits found in a television receiver's tuning system.
				(24) Describe the basic operation of a television tuning system.
				(25) Demonstrate correct procedures for troubleshooting television receiver tuning systems.
				(26) Correctly draft block diagrams of electronic circuitry.
				(27) Correctly draft a variety of schematic symbols used in electronic circuitry.
				(28) Correctly draft schematic diagrams.
				(29) Correctly draft logic diagrams.
				(30) Correctly draft wiring diagrams
				(31) Correctly draft printed circuit board layouts.
				(32) Correctly draft pictorials of electronic circuitry.
				(33) Utilize computer graphics in electronics drafting
				(34) Explain current flow, (conventional and electron).
				(35) Explain what causes current to move through a conductor.
				(36) Manipulate equations and make calculations involving charged bodies, current and voltage.
				(37) Select proper resistors for specific applications using the color code and wattage rating.
				(38) Determine the value and tolerance of a resistor utilizing the color code.
				(39) Recognize series, parallel, and series-parallel circuits by tracing the current flow paths.

4	3	2	1	
				(40) Explain how voltage is distributed around series, parallel, and series-parallel circuits.
				(41) Explain how current divides in series, parallel, and series-parallel circuits.
				(42) Manipulate equations and solve problems involving Kirchoff's Laws for series, parallel and series-parallel circuits.
				(43) Calculate the current in a series circuit when given the applied voltage and resistance.
				(44) Explain the relationships between resistance, current flow and voltage drops within a circuit.
				(45) Calculate the amount of resistance necessary to drop voltage to a desired level.
				(46) Manipulate equations and solve problems using Ohm's Law.
				(47) Determine the proper prefixes associated with electronic terms.
				(48) Define a series circuit.
				(49) Calculate total resistance, total current, and the polarity of the IR drops in a series circuit.
				(50) Describe the difference between a voltage rise and a voltage drop.
				(51) Analyze the use of voltage dividers to provide several different voltages from one source.
				(52) List the power distribution rules for series circuits.
				(53) Analyze the effects of internal resistance on maximum power transfer from source to load.
				(54) Describe the effects of shorts and opens in a series circuit.
				(55) Construct series circuits and make measurements to verify calculation.
				(56) Define a parallel circuit.
				(57) Determine total current in parallel circuits.
				(58) Determine total resistance in parallel circuits.
				(59) Describe power distribution in a parallel circuit.
				(60) Explain the effects of shorts and opens in parallel circuits.
				(61) Construct parallel circuits and make measurements to verify calculation for parallel circuits.
				(62) Identify a series-parallel circuit and simplify to a single equivalent resistance.
				(63) Analyze a series-parallel circuit and make calculations to determine total resistance, voltage, and current.

4	3	2	1	
				(64) Describe the effects of opens and shorts in series-parallel circuits.
				(65) Construct series-parallel circuits and make measurements to verify calculations.
				(66) Analyze DC networks using the Superposition Theorem.
				(67) Analyze DC networks using Thevenin's, and Norton's Theorems.
				(68) Define the relationship between the diameter of a conductor and its specific resistance.
				(69) Describe the characteristics of a good insulator and the characteristics of a good conductor.
				(70) Accurately read and interpret digital multimeters.
				(71) Describe the principle of energy storage in an electrostatic field and the charging and discharging action of capacitors.
				(72) List four factors that determine the capacitance of capacitors.
				(73) Classify different types of capacitors.
				(74) Describe inductance and the factors that determine inductance.
				(75) {RESOURCES} Allocates time*
				(76) Allocates money*
				(77) Allocates material and facility resources*
				(78) Allocates human resources*
				(79) {INFORMATION} Acquires and evaluates information*
				(80) Organizes and maintains information*
				(81) Interprets and communicates information*
				(82) Uses computers to process information*
				(83) Discuss safe working practices for servicing electronic products.
				(84) List, in rank order, the "seven steps for successful troubleshooting".
				(85) Demonstrate proficiency in the use of electronic schematics.
				(86) Demonstrate the correct procedures for taking voltage measurements in electronic circuits.
				(87) Demonstrate the correct procedures for taking ohmic measurements in electronic circuits.

4	3	2	1	
				(88) Describe the basic principles involved in AC generation.
				(89) Define a cycle of AC in terms of alternations, degrees, and radians.
				(90) Define the aspects of AC known as frequency, angular velocity, period, and wavelength.
				(91) Compare schematic symbols used for AC and for DC signal sources.
				(92) Determine peak to peak, peak, average, and effective (RMS) values of sine wave voltages.
				(93) Compare the phase relationships of voltage and current in purely resistive circuits.
				(94) Analyze vector and phasor values as they apply to AC circuits.
				(95) Differentiate between the various types of AC voltages (nonsinusoidal).
				(96) Calculate inductive reactances for series and parallel circuits.
				(97) Determine the phase relationship between voltage and current in an inductive circuit.
				(98) Evaluate power in a purely inductive circuit.
				(99) Describe the types of losses encountered in inductors and transformers.
				(100) Calculate capacitive reactances for series and parallel circuits.
				(101) Determine the phase relationship between voltage and current in a purely capacitive circuit.
				(102) Manipulate equations and solve problems associated with reactive circuit.
				(103) Solve for voltages, current, impedance, and phase angles in series RL circuits.
				(104) Solve for voltages, current, impedance, and phase angles in series RC circuits.
				(105) Solve for voltages, current, impedance, and phase angles in parallel RL circuits.
				(106) Solve for voltages, current, impedance, and phase angles in series RC circuits.
				(107) Solve for voltages, current, impedance, and phase angles in parallel RC circuits.
				(108) Differentiate between true and apparent power and the power factor in AC circuits.
				(109) Apply Thevenin's and Norton's theorems to the solution of AC circuits.
				(110) Define resonant frequency.
				(111) Calculate resonant frequencies for given values of L and C.

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4	3	2	1	
				(112) Evaluate the Q of a resonant circuit, and the effect of Q on bandwidth.
				(113) Discuss the basic characteristics of the common filters used in modern electronic equipment.
				(114) Calculate the component values for basic filters.
				(115) Analyze transformer circuits and utilize turns ratio to calculate voltage, current power and Z.
				(116) Recognize high and low pass filters.
				(117) Recognize bandpass filters
				(118) Explain the relationship between valence band electrons and conductivity.
				(119) Describe covalent bonding.
				(120) Explain the purpose of doping semiconductor materials.
				(121) Name the most commonly used semiconductor materials.
				(122) Describe the differences that exist between N-type and P-type materials.
				(123) Describe the relationship that exists between temperature and conduction.
				(124) Describe the formation of the depletion layer in a PN junction.
				(125) Describe forward and reverse bias and the effects of each on depletion layer width and junction resistance and current.
				(126) Identify the schematic symbol and proper lead placement for PN junction diodes.
				(127) Identify the schematic symbol and proper lead placement for zener diodes.
				(128) Identify the schematic symbol and proper lead placement for light emitting diodes.
				(129) Determine the condition of diodes (open, shorted, or good) using an ohmmeter.
				(130) Construct and analyze simple diode circuits.
				(131) Plot a diode's characteristic curve after taking voltage and current measurements.
				(132) Explain the purpose of an electronic power supply and name the major components involved.
				(133) Calculate peak and DC average output voltage for various rectifier circuits.
				(134) Explain operation of half wave, full wave, and bridge type power supplies.

4	3	2	1	
				(135) Discuss the effect that filtering has on a rectifiers output voltage.
				(136) Explain the operation of a shunt zener regulator and calculate current and voltage values.
				(137) Construct, analyze, and troubleshoot basic rectifier circuits.
				(138) Draw circuit diagrams and their respective input and output waveform for a variety of DC supplies.
				(139) Explain basic bipolar transistor theory and operation.
				(140) Explain the terms, transistor cutoff and transistor saturation.
				(141) Name the three basic transistor configurations.
				(142) Describe the effects of temperature on transistors.
				(143) Demonstrate transistors testing with ohmmeters and with transistor testers.
				(144) Explain what is meant by transistor bias.
				(145) Construct a BJT base bias circuit, and emitter bias circuit, and a voltage divider bias circuit.
				(146) Compare the voltage, current, and power gain of the three transistor circuit configurations.
				(147) Discuss the role of coupling capacitors and bypass capacitors in amplifiers.
				(148) Construct and troubleshoot each of the three transistor configurations.
				(149) Identify Class of amplifiers. (Class A, AB, B, C)
				(150) Describe operating characteristics of the different classes of amplifiers.
				(151) Construct, analyze, and troubleshoot multistage amplifiers.
				(152) Discuss the relationship between frequency, bandwidth, and amplifier gain.
				(153) Calculate and determine bandwidth.
				(154) Perform gain calculations in decibels.
				(155) Analyze the role of voltage regulators and of voltage regulation in power supplies.
				(156) {INTERPERSONAL} Participates as a team member*
				(157) Teaches others*
				(158) Serves clients/customers*

4	3	2	1	
				(159) Exercises leadership*
				(160) Negotiates*
				(161) Works with cultural diversity*
				(162) Describe the characteristics of transmitted radio frequency signals.
				(163) Describe receiving antenna characteristics.
				(164) Explain what is meant by multiband antenna.
				(165) Define transmission line impedance.
				(166) Describe impedances used for television receiver transmission lines.
				(167) Describe the operation of antenna rotators.
				(168) Describe home antenna and transmission line maintenance procedures.
				(169) Discuss cable television systems.
				(170) Discuss TVRO (satellite) systems.
				(171) Explain what is meant by resonance and how resonances are utilized in tuning systems.
				(172) Discuss the oscilloscope as a trouble shooting tool and demonstrate use of an oscilloscope.
				(173) Discuss, in general terms, television receiver servicing.
				(174) Discuss general trouble shooting procedures for isolation and replacement of defective components.
				(175) Discuss television picture transmission and raster formation.
				(176) Explain how picture reproduction is accomplished in the television receiver.
				(177) Explain what is meant by the term, "composite" video signal.
				(178) Describe a modulated video signal.
				(179) Draw a block diagram of a monochrome television receiver and correctly label each block.
				(180) Discuss principle of color television.
				(181) Describe phase relationships of color signals.
				(182) Define "I" and "Q" signals.

4	3	2	1	
				(183) Draw the block diagram of the color section of a television receiver and label each block.
				(184) Describe how a television tuner operates.
				(185) Name the components used in a microprocessor type tuner.
				(186) Describe the functions of the RF amplifier, the mixer, and the local oscillator.
				(187) Demonstrate tuner troubleshooting, (mechanical and electronic systems.)
				(188) Describe the operation of television "AFT" circuitry.
				(189) Describe the operation of ultrasonic remote control systems.
				(190) Describe the operation of infrared remote control systems.
				(191) Demonstrate trouble shooting on remote control systems.
				(192) Describe the purpose and operation of television intermediate frequency amplifiers.
				(193) Demonstrate trouble shooting in video I-F amplifier stages.
				(194) Explain the operation of the video detector circuit of a television receiver.
				(195) Explain how the automatic gain control circuits of a television receiver operate.
				(196) Explain what is meant by the term, "keyed" AGC.
				(197) Demonstrate trouble shooting in AGC circuits.
				(198) Name the circuits that process the audio signals.
				(199) Trace the audio signal from antenna input to LS.
				(200) Demonstrate trouble shooting in audio circuits.
				(201) Draw the schematic symbols for field effect transistors.
				(202) Explain basic operation of FET's.
				(203) Discuss FET biasing.
				(204) Discuss gain and impedance features of FET configurations.
				(205) Discuss the main features of MOSFET devices.

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4	3	2	1	
				(206) List and explain the requirements for proper operation of an oscillator.
				(207) Explain how a multistage discrete amplifier can go into oscillation and how to prevent it.
				(208) Describe the construction and operation of a Colpitts oscillator.
				(209) Describe the construction and operation of a Clapp oscillator.
				(210) Describe the construction and operation of a Hartley oscillator.
				(211) describe the construction and operation of a Armstrong oscillator.
				(212) Compare the crystal controlled oscillator with other types.
				(213) Demonstrate troubleshooting of oscillators.
				(214) Describe the operation of the astable (free running oscillator).
				(215) Define thyristor, list those most widely used, and draw their schematic symbol.
				(216) Describe the operation and function of the SCR crowbar circuit and the phase and speed controller.
				(217) Discuss the operation of the photodetector.
				(218) Describe the operating characteristics and applications of a varactor diode.
				(219) Identify the schematic symbols of the varactor, the constant current diode, the tunnel diode, the Schottky diode, and the PIN diode.
				(220) {SYSTEMS} Understands systems*
				(221) Monitors and corrects performance*
				(222) Improves and designs systems*
				(223) {TECHNOLOGY} Selects technology*
				(224) Applies technology to task*
				(225) Maintains and trouble shoots technology.
				(226) List the advantages of digital techniques over analog.
				(227) Complete conversions between digital and analog numbering systems.
				(228) List the basic types of logic elements, and draw their schematic symbols.

4	3	2	1	
				(229) Explain the operation and draw truth tables for each of the following gates, AND, OR, NAND, NOT.
				(230) Describe the operation of the following, TTL, ECL, and CMOS I-C's.
				(231) Construct and prove truth tables for flip flops, counters.
				(232) Explain the principles of magnetic recording.
				(233) Describe the operation of VCR record and playback heads.
				(234) Describe VCR servo system operation and troubleshoot servo systems.
				(235) Describe mechanical operations in a VCR and trouble shoot VCR mechanics.
				(236) Describe VCR protection circuits.
				(237) Demonstrate repair on a variety of VCR faults.
				(238) {BASIC SKILLS} Reads*
				(239) Writes*
				(240) Employs arithmetic and mathematics*
				(241) Uses speaking and listening skills*
				(242) Describe the operating system of a microcomputer.
				(243) Draw the block diagram of a microcomputer and correctly label each block.
				(244) Discuss computer programs.
				(245) Describe the steps taken when a problem develops in a microcomputer.
				(246) Demonstrate replacement of computer boards and replacement of hard and floppy drives.
				(247) Demonstrate replacement of computer power supplies.
				(248) Demonstrate techniques applied when trouble a microcomputer.
				(249) Completely assemble a microcomputer and prove that it works correctly after assembly is completed.
				(250) {THINKING SKILLS} Thinks creatively*
				(251) Makes decisions*
				(252) Solves problems*
				(253) Sees things in the mind's eye*

4	3	2	1	
				(254) Knows how to learn*
				(255) Reasons*
				(256) {PERSONAL QUALITIES} Assumes responsibility*
				(257) Has self esteem*
				(258) Is sociable*
				(259) Practices self-management and has integrity*
				(260) Describe the operation of television picture tubes.
				(261) Describe the purpose and operation of automatic degaussing circuits.
				(262) Complete a gray scale set up on a color television receiver.
				(263) Demonstrate pix tube testing and trouble shooting.
				(264) Describe the purpose and operation of video amplifiers in television receivers.
				(265) Demonstrate trouble shooting on a variety of video amplifier faults.
				(266) Describe the operation of the basic power supply used in television receivers.
				(267) Describe scan derived low voltage power supplies.
				(268) Demonstrate troubleshooting on a variety of power supply faults.
				(269) Describe the operation of and demonstrate trouble shooting techniques for sync separators.
				(270) Discuss different types of television deflection oscillators and demonstrate troubleshooting techniques for deflection oscillators.
				(271) Describe horizontal AFC circuits and demonstrate trouble shooting for horiz. AFC circuits.
				(272) Describe the operation of vertical deflection circuits and demonstrate troubleshooting techniques for vertical deflection circuits.
				(273) Describe the operation of horizontal output amplifier systems and demonstrate trouble shooting of horiz. amplifier systems.

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4	3	2	1

(274) Describe the operation of the bandpass amplifier circuitry and demonstrate troubleshooting of bandpass amplifier circuitry.

(275) Describe the operation of color demodulator circuitry and demonstrate troubleshooting techniques for demodulator circuitry.

(276) Demonstrate good customer relations techniques.

Electronic/Engineering Technology
CIP # 15.0399

34 Respondents

R = Required at entry by 50+ % of respondents
R* = Required at entry with **full competency** by 50+ % of respondents
U = Unnecessary at entry according to 50+ % of respondents
U_t = Unnessary at entry because of skill being taught by 50+ % of respondents
NC = No consensus

I	**MATHEMATICS**	
	Whole Numbers	
1	Write whole numbers from written text (six thousand three = 6003)	R*
2	Add and subtract single and multiple digit whole numbers	R*
3	Multiply and divide single and multiple digit whole numbers	R*
4	Use arithmetic operations to solve word problems with whole numbers	R*
5	Read and count single and multiple digit whole numbers	R*
6	Round off single and multiple digit whole numbers	R*
7	Perform arithmetic operations using correct hierarchy	R*
	Fractions	
8	Read and write common fractions	R*
9	Add and subtract common fractions	R*
10	Multiply and divide common fractions	R*
11	Solve word problems with common fractions	R*
12	Reduce fractions to lowest terms	R*
13	Find common denominator	R*
14	Change fractions from one denominator to another	R*
15	Translate a mixed number into an improper fraction and reverse	R*
	Decimals	
16	Carry out arithmetic computations involving dollars and cents	R*
17	Read and write decimals with one or more places	R*
18	Round off decimals to one or more places	R*
19	Multiply and divide decimals with one or more places	R*
20	Add and subtract decimals with one or more places	R*
21	Solve word problems with decimals in one or more places	R*
22	Write digit equivalents of orally stated decimal number	R*
23	Convert fraction to decimal equivalent and vice versa	R*
24	Convert decimal number to percent and vice versa	R*
25	Read and write percents	R*
26	Compute percents	R*
	Mixed Operations	
27	Convert mixed numbers to decimals and decimal fractions to mixed numbers	R*
28	Solve word problems	R*
29	Compute averages	R*
30	Solve problems involving ration and proportion	R*
	Measurement and Calculation	
31	Perform conversions within metric system (weight, distance, volume)	R*
32	Solve problems involving time, weight, distance and volume	R*
33	Use a calculator to perform basic arithmetic operations	R*
34	Use formulas appropriately	R*
	Estimation	
35	Determine if a solution to a mathematical problem is reasonable	R*
36	Estimate distances in inches, feet, yards and miles	R*
	Business Math	
37	Compute simple and compound interest	U
38	Calculate discounts	U
39	Compute profit and loss and unit price	U
40	Compute commissions	U
41	Compute sales tax	U
42	Compute depreciation	U
43	Use concepts of percent, base and rate	U
44	Convert chain discounts into single discount equivalents	U
45	Graph data using bar, line and pie graphs	U
46	Interpret and use appropriately terms of sale	U
47	Reconcile a bank statement	U
48	Use a calculator to solve problems using scientific notation	R
	Algebra	
49	Add, subtract, multiply and divide algebraic expressions	R
50	Solve linear equations in one variable	R
51	Solve linear inequalities	R
52	Solve systems of linear equations	R
53	Solve systems of inequality	R
54	Construct graphs on coordinate plane	R
55	Factor	R
56	Add, subtract, multiply and divide algebraic fractions	R
57	Use exponents and square roots appropriately	R
58	Use direct and inverse variation to solve word problems	R
59	Solve quadratic equations by factoring	U
60	Convert base ten numbers to other base numbers systems	[illegible]
	Ratio and Proportion	
61	Solve basic ratio problems	[illegible]
62	Solve proportion problems with one unknown	R
63	Reduce ratios to lowest terms	R
64	Utilize ratio and proportion to solve word problems	R
	Geometry	
65	Recognize and name types of angles	R
66	Recognize and name geometric figures	R
67	Find sine, cosine and tangent of an angle using a table and calculator	R
68	Solve problems to find length of sides and angles of geometric figures	U
	Formal Logic	
69	Obtain unions and intersections of given sets	U
70	Prepare a truth table	U

Figure 3

Source: PREREQUISITE SKILLS FOR POSTSECONDARY VOCATIONAL PROGRAMS: A SUPPLEMENT, Vernon Regional Junior College, Texas Higher Education Coordinating Board

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Continued Figure 3:

II	COMMUNICATIONS SKILLS	
	Written Expression	
71	Use plural words correctly	R
72	Use appropriate contractions with apostrophe	R
73	Use correct abbreviations of words	R
74	Use appropriately words often confused because of similar sounds	R
75	Distinguish between homonyms	R
76	Use words effectively which are opposite of one another	R
77	Use words appropriate for a specific audience and purposes	R
78	Add proper beginnings and endings to words to change their meanings	R
79	Punctuate one's own correspondence	R
80	Use apostrophes correctly to show the possessive form of nouns	R
81	Capitalize words correctly	R
82	Use appropriate definitions for words with more than one meaning	R
83	Review and edit others' correspondence, directives, and reports	R
84	Compose logical and understandable correspondence and reports	R
85	Write clear, correct statements to fill out forms accurately	R
86	Spell correctly	R
87	Use correct idioms	R
88	Distinguish between complete sentences and fragments	R
89	Use verbs that agree with subjects	R
90	Use the correct tenses of verbs	R
91	Organize ideas in essay form	R
92	Interpret ideas in terms of one's own viewpoint or values	R
93	State one's position in a clear, logical manner	R
94	Defend one's point of view convincingly	R
95	Compile notes taken from several sources into a documented report	R
96	Use citations correctly	R
97	Compile materials supplied by others into a single report	R
98	Construct a logical outline	R
99	Use varied sentence structure	R
100	Combine sentences through logical subordination	R
101	Use words effectively that indicate a transition from one idea to another	R
	Reading/Verbal Reasoning	
102	Find, read and understand information written on the 8th grade level	R*
103	Find, read and understand information written on the 10th grade level	R*
104	Find, read and understand information written on the 12th grade level	R
105	Find, read and understand information written on the 14th grade level	NC
106	Read information written on a level of difficulty above grade 14	U
107	Paraphrase a passage to confirm one's understanding of what was read	R
108	Read and interpret job-related forms	R
109	Read and understand short notes, memos and letters	R
110	Read and understand graphs, maps, charts and tables	R
111	Use context and signal words to determine definitions of new words	R
112	Distinguish between the major premise and supporting facts	R
113	Use a dictionary to find meaning, pronunciation and spelling of words	R
114	Use the telephone directory to make local and long distance calls	R*
115	Use textbook features, such as index, table of contents, glossaries, etc.	R*
116	Distinguish between facts and opinion	R
117	Identify the conclusions in written or oral communications	R
118	Evaluate the relevance and strength of support for a conclusion	R
119	Explain the main idea in written and oral communications	R
120	Recall information accurately from memory	R
121	Carry out correctly written or oral instructions	R
122	Judge the credibility of a source of information	R
123	Recognize patterns of organization of information - cause/effect	R
124	Diagram simple and complex sentences	U
125	Use a thesaurus	R

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ASSESSMENT AND CERTIFICATION STRATEGIES

for

ELECTRICAL ENGINEERING TECHNICIANS

TEXAS SKILLS STANDARDS AND CERTIFICATION PROJECT

by

TEXAS INSTRUMENTS

and

The University of North Texas

with support from

THE ELECTRONICS INDUSTRY FOUNDATION

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Prepared by:

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ASSESSMENT AND CERTIFICATION STRATEGIES FOR ELECTRONIC TECHNICIANS

INTRODUCTION:

This document contains information regarding workplace driven assessment and certification of completers of electronic engineering technician programs of Texas community and technical colleges. Accountability for educational institutions, and especially for public community and technical colleges in Texas is an increasing concern for taxpayers, legislators, and business and industry. The Texas Higher Education Coordinating Board as mandated by **Senate Bill 642** (1993) is required to determine the effectiveness of public postsecondary occupational preparation education and training programs by collecting information to:

> ***"(1) evaluate the effectiveness of workforce education programs; (2) determine whether a public or private workforce education program is not effective in placing persons who successfully complete the program in jobs related to person's training; and (3) determine whether to continue, expand, or terminate a program established under Section 61.051, Education Code."***

Senate Bill 642 implies that job placement is an indicator of program accountability for "*. . . **persons who successfully complete the program in jobs related to the person's training;***". Senate Bill 642 did not define or explain what is meant by "*successfully complete the program.*" Initial job placement and job retention are not the same. Therefore, job placement of successful program completers is not the most accurate measure of program accountability. Job placement information is very valuable in determining program quality, but other variables hinder the use of job placement data in determining, to the greatest degree, the accountability and effectiveness of occupational preparation programs.

Senate Bill 642 requires the use of job information of "*persons who successfully complete the program*" to determine program effectiveness. The question is then "**What are the criteria and measures used for determining `successful completion' of a program?**" The use of the terms "**criteria**" and "**measures**" indicate testing and assessment.

Testing and assessment have become fundamental to our way of life. Testing and assessment have long been used in the educational process to determine educational attainment or successful completion of courses and programs. In business and industry services and products are routinely tested and assessed to assure quality. Individuals and products that are determined by assessment to have met specified standards are in many situations, issued a certificate to document the achievement of the specified standards as established by a recognized entity related to the purpose of the assessment.

Congress is well aware of the need for occupational preparation program accountability in achieving the national goal of developing and maintaining an American work force that is competitive world wide. As a result of this awareness, Congress has mandated in **GOALS 2000: EDUCATE AMERICA ACT, Title V,** the creation of a National **Skill Standard Board.** The purpose of the National Skill Standard Board is as stated in **Section 502:**

> ***"It is the purpose of this title to establish a National Skill Standards Board to serve as a catalyst in simulating the development and adoption of a voluntary system of skill standards and of assessment and certification of attainment of skill standards . . .."***

The national system of skill standards, assessment, and certification is proposed to have several benefits which include the use of the system's products and guidelines, consistent with civil rights laws:

> ***"(F) by students and entry level workers, to determine the skill levels and competencies needed to be obtained in order to compete effectively for high wage jobs;"***

"*(G) by training providers and educators, to determine appropriate training services to offer;*" and

"*(H) by government, to evaluate whether publicly funded training assists participants to meet skill standards where such standards exist and thereby protect the integrity of public expenditures;*".

Based on the above citations, accountability of public funded occupational education and training programs is now mandated by law and a system has been created to establish measures to determine accountability.

PROCEDURES:

One of the products to be produced by the **Skills Standards and Certification Projects** was a "*Testing and Certification Strategies Document.*" The purpose and content of the document as stated in the RFP were to "*recommend approaches and strategies for how training institutions and businesses might enhance current testing and certification methods by incorporating the products of this project.*"

Since time and resources available to the project did not provide an opportunity for in-depth research to meet the specifications of the RFP, a review of the literature was the basic tool used for obtaining information to be used in the preparation of this document. A review of the literature was done to:

(1) identify entities that offered a certification for electronic engineering technicians, provided occupational competency examinations for electronic engineering technicians, and provide for the accreditation of electrical engineering programs;

(2) identify issues and concerns related to assessment of skill standards (work place requirements) and certification of individuals completing an electronics engineering technician program; and

(3) review current testing instruments used by Texas public community and technical colleges to asses this attainment of the technical competencies and SCANS competencies by students.

ISSUES: Certification/Accreditation

Concurrently with the duration of this project the project staff has had the opportunity to participate in focus groups convened by Texas Instruments and the Electronics Industries Foundation for the **National Skills Standards Development Project for Basic Electronics.** As with this project, the National Skills Standards Project for Basic Electronics is addressing the topic of certification. Addressing the topic of certification of technicians has brought about the issue of "*certification and/or accreditation*".

During the last focus group convened in Dallas, Texas by the Electronics Industries Foundation (EIF) for the purpose of discussing accreditation and certification of electronic technicians, the issue addressed by the members of the focus group was:

> *"Electronic technicians could be certified in one of three ways in terms of their knowledge and skills based on the skill standards:*
>
> *(a) by successful completion of an accredited program based on the skill standards;*
>
> *(b) by passage of a certification exam;*
>
> *(c) by successful completion of an accredited program and passage of an exam."*

The focus group that met in Dallas (one of several convened by the Electronic Industries Foundation) consisted of approximately twenty-six educators, who were predominately instructors of postsecondary electronic programs, and twenty-one practicing electronic technicians/supervisors. Members of the focus group discussed and responded to seven questions about accreditation of electronic technician programs and certification of electronic technicians. Following are the seven questions and a synthesis of the responses to the questions.

1. Do you favor accreditation of electronics training programs?
   a. Is there a need for:

Educators 1: Agreed that there is a need for certification/accreditation, but needs to be done by an "outside of education" or other than educational institutions organization/agency who is in charge of the exam and/or process.

Agreed that the program must also be accredited because of "experience level" skewing examinations.

Educators 2: Agreed that there is a need and it could eliminate the diploma mills which are often schools which take the students money but do not train.

Passing a program does not always mean that one can do the job.

Needs to be test for student, and perhaps associations should give licensure, government agencies should accredit programs, and an outsider should do individual testing.

Educators 3: Already covered - same general comments

Technicians: Most do not consider it to be beneficial as technology changes so quickly.

Supervisors of Technicians: Generally, it would not be that important; interviews get most of the important information; would be good to use a screening prior to interview; responsibility goes back to company and how well they screen potential employees; If this is done, it should be based on competencies; programs should be accredited; Certification of individual and accredited programs should be available, but not necessary for both; Competency profiles would be good to have a record of what the individual can do after training.

b. Would it make a significant difference in your recruitment of students and placement of graduates if your program were endorsed or accredited based on the skill standards?

Educators: Agreed that it would add just another plus to the documentation of a good training program. Employers might use as a hiring/screening tool. Judged mostly on the product - the quality of student.

Technicians: Do not believe it makes a difference in hiring/placement -that is determined by how well one presents oneself at interview; need of company; timing - right place/right time; high grades in training program; most felt resume, interview, test, and probationary period for proof would be just as good in getting the job.

Supervisors: Would help with the initial screening only, interview still necessary.

Many programs call their students "technicians", but not all mean the same thing.

c. Would accreditation add much value to your present diploma or certificate?

Educators 1: Would be a plus, but the advisory boards already judge programs as do employers based on capabilities of recent employees from that training institution.

Instructors would have to also be certified as the program depends on the capabilities of the instructor in many instances.

Considerations: What happens to foreign students? Could they be harmed by a program accreditation vs. student exam certification?

Educators 2: Agree that programs and instructors should have credentials.

Technicians: If there was an accrediting process, students would more likely attend those programs because industry would be more likely to hire from those institutions; could be a barrier because of limited resources, some students may not be able to travel to the accredited program and therefore would not be considered when s/he may be as capable.

Supervisors: See comments above in this area as the same comments were made.

2. If in favor of accreditation, should there be a single endorsement or accreditation program for all training institutions nationwide, or should accreditation programs be developed at the state level?

Educators: Programs in educational institutions are "accredited" now - recommend certification at national level. Finally, all agreed to national vs. state accreditation.

If developed at state level as state-to-state, employer's needs are different and an exam for recertification would need to be taken in each state. That should only apply to students and not to programs.

Educators: Needs to be national accreditation as technicians do move.

Technicians: See above statements - accrediting does not always produce the best students. Most agree that if there is an accrediting process, then it should

be one single certification and should be permanent with on-site training or continuing education to stay abreast of changes.

Supervisors: Prefer nationwide as that allows for others outside of the state to bring same documents for employment purposes.

a. What nongovernmental national or state-level organizations can you think of that might appropriately develop and operate an accreditation program?

Educators: Advisory Board, state associations could operate accreditation process, but industry should set the standards.

Educators: Anyone but the government.

Technicians: Anyone but the persons training, hiring, or the government.

Supervisors: Will individual credentialling take into consideration "experience" rather than accredited program? Also, same general statements as above.

b. What role would you expect educators to take in the development of accreditation programs and their implementation?

Educators: Should be a part of the development and would have to be approved in some way to be the instructors of such programs.

Educators: An accreditation process would allow for one institution to compete against another based on equipment, certified instructors, facilities, etc. Curriculum should be based on industry standards.

Considerations:

Placement of students will significantly improve - not recruitment

National standards and accreditation and certifications should be developed/used

Educators should have advisory role in development

Most in favor of program accreditation

Supervisors: From a logistical standpoint, educators can do this easier than anyone else because of the system already in place. Business/industry standards must, at all times, be the focal point.

3. Do you think a national certification exam for entry-level technicians is important or necessary?

Educators: Very important because of high growth of industry; should have national level exam; should have regional test sites; third parties should administer, not schools or companies; Already in place i.e. ICET, can use school sites, but educators not give it; schools can support testing vehicles, infrastructure, preparation of student;

Educators: Need to have continuing education up-dates annually - one exam should not be forever.

Technicians: A one-time certification exam only and then only if trained in a non-accredited program. Why wouldn't the degree or certification program at the training cite be enough?

Supervisors: It would help if it were nationally approved by the field or industry because we would have an idea what the person could bring for application and what the person was supposed to be able to do. Would allow for individuals to take exam who had not been trained in a traditional way.

a. What nongovernmental national or state-level organizations can you think of that might appropriately develop and operate a certification exam?

Educators: Not developed by anyone other than industry based on standards; should not be government anything; need state/federal mandate for requirement for certification

Supervisors: Educators have the resources to develop the exam based on industry standards and then have the exams approved/validated by industry.

b. What role would you expect educators to take in the development of certification exams? In the administration of the exams?

Educators: Advisory role only on both parts.

Educators: Should be on advisory group, but not always valid if the trainers give the test; localized centers do well in providing such testing

Supervisors: Education sites or center sites O.K. for administering, but not the instructors themselves or the industry/company employees administering.

4. Based on your experience, who would employers prefer; a person who had not taken a national exam but had completed a program of known quality or a person who had passed a national exam after completing a training program of unknown quality?

Educators: Better institution is better than national exam; companies now ask such questions as to certification so think it would be preferred; Believe it would be best choice.

Educators: Exam should be nationwide drawn from a bank of questions to that politics does not pay a part. Like the ACT or National Standard Exams, it should b validated every year. Problem might be that the employers do not know what the exams really test for or mean in terms of future employees.

Supervisors: Accredited vs. certified. Stress accredited institutions with minimum requirements. Object to special endorsements. Just a method to prove the person is competent. How broad of an educational background do they need? A certified program or an exam, do not duplicate or make redundant.

a. What is your opinion of companies' using passage of such an exam as an implied requirement for employment by advertising a preference for certified applicants?

Educators: Already do this and most have no problems with this.

Educators: Biggest problem for employers is the entry-level employees do not have the basic skills. This could help them to know more of what to expect from persons coming from accredited programs and of the exams based on a real scoring that could be useful.

Technicians: Some already do this and so if that is what the company wants, then a good exam should be available.

Supervisors: O.K. for initial screening, but still need team interview for hiring.

5. Do you think there is a need for both accredited training programs and a national certification examination?

Educators: Concurrently? No, if already accredited why the need for testing - duplication of costs. Southern Association (SACS) accredits institutions, not students so it is not duplication; question who understands content to do accrediting or certification exams; Program Level Accreditation is consensus of group and at what level required was not in agreement;

Educators: Should have the option of both.

Supervisors: Again, there is time and place for both, but both would not necessarily be required.

a. In your opinion, are they roughly equivalent? If there are difference, what are they?

Do you think employers would consider them roughly equivalent? If not, what differences might they identify?

Educators: Exam allows for "testing out" if knowledge and skill has been obtained instead of must do seat time which could mean nothing.

Either could mean a lot or a little, dependent on quality
Should not be federally mandated, employers should have a choice; cost factors;

Technicians: Allows one to demonstrate capabilities if there is an exam and the person did learn in the military or some other nontraditional way.

Supervisors: Allows the person to demonstrate the competencies, but should this not be done in a program as well?

6. Would you recommend that certification be awarded only to those who successfully completed both an accredited training program and a certification exam? If so, how would you accommodate those trained in the military? In apprenticeships?

Educators: No, again, test out if can do already;

Technicians: If one can pass the exam, why would they have to do the course work? Not necessary.

Supervisors: See no need for both being required.

7. Of the three possible uses of the skill standards to achieve certification, which do you favor most: Successful completion of an accredited training program? Passage of a certification exam? a combination of the two?

Educators: Program level accreditation is consensus of group. Level debated.

Technicians: Each could be available, but one is enough depending on the route one took to learn the job.

Supervisors: One or the other needed, but either need industry validation.

Special features:

1. If the industry group implementing the skill standards were to set up a process for endorsing or accrediting training programs, it is likely that an institution's use of the skill standards as a basis for training would play a significant role in accreditation. The following performance areas are based on the skill standards. Which do you think schools are best able to train their students in now?

    - The mastery of basic and practical skills (Including problem-solving and technical literacy). Basic skills include geometry, trigonometry, and some physics.

- The mastery of technical skills (including troubleshooting and training on actual equipment).
- The use of test equipment and tools
- The development of desirable work habits and behaviors (including work ethics and interpersonal skills).
- The foundation for additional training (basic understanding of communications, electromechanics and laser applications).

Educators: 1st - technical skills
2nd - teamwork
3rd - test equipment* * (is a subset of technical skills)
4th - behavior

Technicians: Only hands-on show what a person really can do.

Supervisors: We can teach the technical needs, if the basics are in place.

a. Of those same areas, which do you think schools might have the most problems with today? What are some ways those problems can be solved?

Educators: Motivation, behavior, need all as a team and we emphasize team work now; time management needs a lot of work and in important as is notetaking which they need help with.

Technicians: Hands-on is difficult for educators to provide.

Supervisors: Industry changes so fast, education cannot always keep up with new equipment.

b. In some fields, program accreditation has been tied to the percent of program completers who pass a certification exam. Do you favor this approach?

Educators: Ultimate test is if hirees perform accordingly when hired.

Technicians: Again, if the student passes the program, why have to take the exam. Can they do the job is the question and either method should prove that.

Supervisors: A specific grade showing what the person can do. Should be broken down into specific categories.

2. A number of steps would be important in the accreditation process. What steps do you consider essential or important: Site visits? References from employers of recent trainees? What others?

Educators: All of the above and responses from graduates.

Educators: All of the above.

Technicians: Ask the students who completed the program and have been employed about how well they were prepared.

Supervisors: If we have hired someone from a program, we have knowledge of what the person has learned. Believe site visits by industry persons would help.

3. In your judgement, how important is it that accredited programs be taught by certified instructors whose certification was based on skill standards?

Educators: Very important, how can they teach if they are not as good in the same areas?

Disagreement from some on basis that interviews decide who is hired and ICET can be minimum qualification exam and/or degree(s). MOST BELIEVE CERTIFICATIONS AND DEGREES WITH INTERVIEWS ARE ENOUGH.

Educators: Educational institutions lose credibility if instructors aren't certified. Community/technical Colleges and universities do not regulate teaching credentials, but must have passed a certification exam.

Supervisors: Our concerns is what can the new employee do.

a. If important, should the certification of instructors be granted based on training and experience? On the basis of a national exam? On the basis of both?

Educators: See statements above in 3.

Technicians: Either, but not both.

4. If there were a national (define national) exam for certifying individuals as well qualified, entry-level technicians, how much information would you expect the exam to report: only pass/fail status? passing at several levels (e.g. basic, advanced)? passing in major skill areas in what would amount to a skills profile?

Educators: Not just pass/fail, need % correct to pinpoint weaknesses; need specific numbers but then cutoff and lower become problem; student to have breakdown in seven areas, not employers; so say 75% = pass, <75% = fail, but not just pass/fail. Others agreed that a skills profile properly designed should be able to do this without pass/fail as it would be based on skill standard competencies and the proficiency in those.

Educators: For an entry level pass/fail enough; IOL come with pass/fail - after that you get levels of proficiency.

Technicians: Should be based on what the companies want.

Supervisors: Specific scores broken down into categories showing what the person was strong in and what the person was not so strong at doing.

5. If there were a national exam for certifying entry-level technicians, which kinds of assessments would you consider essential? Which would you consider not essential but desirable?

   a. paper and pencil tests of technical knowledge
   b. responses to simulations (computers or video based)
   c. Hands-on performance (e.g. use of tools and techniques)
   d. technical reading skills (including schematics)
   e. technical writing skills
   f. listening skills (technical content)
   g. others (describe)

Educators: All agree only realistic way is theory class testing, but hands-on would be valuable. All agree that hand-on testing could be impractical except through computer simulations. Believe that school should provide hand-on "proficient" testing during training and that comes with accreditation of training institutions.

Educators: a - essential; b - desirable to vague; c - essential; d-essential (desired) evaluation will be very subjective; e - desirable/essential/ technical writing can I explain it to you in writing and document what is found-problem with semantics and technical writing is higher level to me than entry level; can they write a complete sentence is an understandable need or write a report; f - essential -# 1 essential; g- oral communication in general preference and test should include instrumentation use of job specific reading; interpersonal skills should be a part but how do you teach them team work because very difficult to use teaming in an academic environment.

Technicians: Hands-on performance

Supervisors: Both hands-on and paper/pencil, it is important that they have the basic skills.

6. If a certification exam were given, do you think certification should be something that would enhance the likelihood of getting a job or should it be, in essence, required? If it were voluntary, would you recommend that a person seeking initial employment as a technician take the exam?

Educators: That would be the decision of the industry; voluntary or not would recommend students take; depend on how industry/employers would see the need.

Technicians: Would just add to what the students had for the interview process, but the interview is the final method for deciding who to hire.

Supervisors: Good starting basis, but would not be only consideration.

7. Do you think there should be a fee to take the exam? How much would be reasonable? What do you think is the most an entry-level worker would pay to take such an exam; if it were voluntary? if it were "required"?

Educators: Agree there should be a fee to cover expenses; industry should pay if they are saying that they are going to hire ONLY certified employees; $50 to $500 - depends on the test and the voluntary to required statement. $50 would be reasonable for pen/paper but hands-on could cost up to $500.

Test takers would/should pay fee just like all other professions with certifying exams.

Technicians: If the school is there to make a profit, then the school should pay because the accreditation would likely bring in more students.

When student comes out of school, student should pay or maybe the company wanting to hire that student as the company or government can write off the cost. Maybe it could be a reimbursement when hired.

If student went through an educational training program, the program should be enough without an exam which one must also pay for.

Considerations:

Technicians: Would new "certified" employees be promoted faster than those already on the job? Would persons on the job now be required to go back and take the exam? I believe the certified employees would or could advance beyond the current, more experienced employees so the exam would be there for those who did not have the educational program.

Some jobs do not match the exam so the company would not consider the exam important. Again, it goes back to what the company wants and how much industry approved of the programs and exam. The only path now for upward mobility for the entry-level employee is to go back and get a BS degree. Maybe an exam could help there.

Supervisors: Not required exam, voluntary, person pay fees - $50 - $100. For those already working, companies would pay if they wanted the employees to take, if new hire, the new hire would pay.

Considerations:

Too many terms, accredited, certified, diploma, etc., make one standard, not a bunch of bull.
School accreditation, individual certification on voluntary basis
Medical field, certification if endorsed, will become mandatory for all so certifying programs for a specific field better.
Needs to be quantitative, raw scores etc.
Needs to address a "grandfather clause" for technicians now employed.

FINDINGS:

The reactions of the EIF Dallas Focus Group and the review of the literature conducted for assessment and certification phase of this project resulted in the findings described in the following narrative.

A. Certification

It was found, based on the review of the synthesis of the responses of the Focus Group for accreditation of electronic engineering technicians programs and certification of electronic engineering technicians that:

1. electronic training programs should be accredited on a national basis by a voluntary non-governmental agency;

2. electronic technicians should be certified on a national basis by a voluntary non-governmental organization;

3. the certification of electronic technicians be based on the assessed attainment of skill standards validated by business/industry;

4. electronic technician programs should be taught only by instructors who are certified as electronic technicians;

5. certification exams should include an assessment of both cognitive and psychomotor skills; and

6. electronic technician preparation programs should use "hands-on proficiency" testing during training;

7. certification of electronic technicians and accreditation of electronic technician programs should be one on a national basis by a non-governmental agency/organization.

The best description of certification organizations/agencies for electronic technicians was found in the document, "*Industry Driven Skill Standards Systems In the United States, Volume III*", prepared by **The Institute for Educational Leadership**. The following description of **Certification Programs for Electric Technicians is an excerpt from** "*Industry Driven Skill Standards Systems in the United States, Volume III*" on pages 45 and 46.

Organization:

Electronics Technicians Association (ETA)
Address and Telephone: 602 North Jackson, Greencastle, Ind. 46135, (317) 653-8262

Contact: Richard L. Glass, CETsr President

Context: There is a close connection between the ETA and the National Satellite Professional Dealers Association (SDA) as Mr. Glass serves as President of both organizations. However, the following material will address only the ETA certification program that was established in 1978. The program focuses on examinations that have a basic exam and specialty options in six areas. These areas include: 1. Consumer electronics with two subspecialties (radio-television or audio hi-fi). 2. Communications electronics with two specialties (two-way or aviation electronics). 3. Commercial electronics with two specialties (master television antenna and videotape recording). 4. Biomedical electronics. 5. Industrial electronics; and 6. Computer electronics.

Who is eligible: Minimal criteria is less than four years of experience or schooling.

Course of Study/Prerequisites: There is no formal educational course of study required. The prerequisites are described under next section.

Levels of Certification: There are four levels: Associate, Journeyman, Senior, Master.

For the levels of Associate, individuals with less than four year of experience or schooling may attempt only this portion. For the Certified Electronics Technician or Journeyman, four or more years of combined schooling and/or experience plus taking one of the specialty exams noted above. For the Senior Technicians, at least eight years in the profession and taking at least one specialty exam. Master technician is reserved for those who are proficient in all six major areas and have at least eight years as a CET.

Who manages: The University of Iowa's Engineering Extension manages the examination process.

How financed: Fees that vary by level of test, $25 for associate up to $80 for Master. If all specialty options were included, the total would be $210.

Partners: The exam is authorized by the military DANTES. Also in 1992, ETA and the SDA signed a agreements with Central Community College Ky., which has several campuses and recognizes ETA and SDA seminars as being eligible for college credit.

Organization:

National Electronic Sales and Service Dealers Association
2708 W. Berry Street, #3 Ft. Worth, TX 76109 (817) 921-9061

Contact: Clyde Nabors

System has been operating since 1965 with 35,000 certified and 2,030 members.

Organization gives two exams to certify electronic technicians:

If less than four years experience take associate exam.

If more than four years take second level. Exam is for whatever field they want to specialize in (eight options).

Some volunteers who are electronics instructors use their curriculum to teach classes at junior colleges and colleges.

Organization:

International Society of Certified Electronic Technicians
2708 W. Berry Street, Suite 3 Fort Worth, TX 76109

Contact: Alice Johnson

System has been operating for 25 years with 35,000 certified and 2,000 members. The association provides an associate level and a full journeyman level certification. To become an associate, one must pass a written exam that includes calculation and measurement. To become a journeyman, one must pass the associate's exam as well as test in an area of specialization.

The society offers courses at its conferences.

Organization requires no prerequisites to become an associate, but one must have four years of experience to take the journeyman exam.

Several states require that a technician be certified before a business can be licensed to operate.

The society publishes study guides which are to sold to college bookstores.

B. Assessment

Assessment or testing is an accepted and integral component of the education system. Students are graded and classified on the basis of how well they perform on teacher made tests and standardized tests. Assessments are done to determine mastery of instructional content in terms of the level of skill or knowledge developed by instruction. In occupational education and training programs assessment relates to program accountability.

Perkins II (PL 101-392) requires accountability of recipients of Perkins II funds. Each state administering Perkins II funds are required to develop and implement a statewide system of core standards and measures of performance for secondary and postsecondary vocational/technical education programs. The statewide system of core standards and measures of performance must include *measures of learning and attainment of academic and occupational competencies.*

In the revised definition of *coherent sequence of courses* of 34 CFR[1], it is stated: "*The Secretary believes that congress clearly intended that competency-based vocational programs be funded under the Act. . ..*" Based on these two requirements of Perkins II for accountability in terms of performance and competency-based programs, it is evident that performances measures and standards must relate to and be based on the occupational competencies (skill standards) of the workplace.

It is apparent that Perkins II requires the curricula and instructional content of vocational/technical preparation programs be based on the competencies of the workplace. When the curricula and instructional content of a program are developed from the competencies of the workplace, the curricula are referred to as *competency-based curricula*.

The use of a competency-based curricula and the delivery of the curricula is supported by both mandate and implied mandate. The Technical and Vocational Program Guidelines - 1989 of the Texas Higher Education Coordinating Board (CB) advocate the use of competency-based curricula and instruction. The Guidelines provide the following definition:

> Competency-based education is designed to teach job related clusters of skills and knowledge, the mastery of which forms the basis upon which the student is evaluated; competency-based programs must possess the following characteristics:
>
> 1. Involvement of business and industry in the determination of the job competencies and the expected performance level required for successful employment within a defined job or cluster of jobs.
> 2. Course sequence which allows the mastery of competencies leading to the satisfactory performance of all identified competencies.

The above definition clearly directs that the curriculum and instructional content of postsecondary occupational preparation programs shall be competency-based.

Competency-based instruction in technical and vocational education has been described as an instructional delivery system that provides a process by which students develop measurable performance competencies, specified by business and industry, that will assist students in obtaining gainful employment based on their ability to perform in a productive manner.

With business and industry demanding that entry-level employees have competencies, the national concern for educational accountability, and the need to serve special populations without "diluting" the curriculum, the concept of competency-based instruction is receiving considerable attention again. As we have seen with the use of buzzwords in other innovations and concepts, it has been popular to talk about competency-based instruction with enthusiasm even if it has not been well understood. Postsecondary technical and vocational education personnel in Texas are moving away from the conversational use of the concept and are in the process of moving toward a phase of design, actualization, and implementation of a competency-based instruction system.

In the report of the **STATE ASSESSMENT**, for **Section 116** of Perkins II, prepared by the Texas Higher Education Coordinating Board, (there were two recommendations that support and can use competency-based instruction in the achievement of the two recommendations). The two recommendations made for *Criteria Factor II: Sequential courses of study leading to both academic and occupational competencies* are:

3. Public community colleges and technical institutes should develop a periodic review process to ensure that applied basic work skills are incorporated into the curriculum of each technical program.
4. Public community colleges and technical institutes should develop a periodic assessment to ensure that competency-based instruction is incorporated in all programs.

The achievement of recommendation "4" stated above will require the development of a model for developing and administering competency exams that can be used by individual institutions for the periodic assessment of competency-based instruction.

Accountability of vocational education and job training is also a concern of the Employment and Training Administration of the U.S. Department of Labor. Accountability of job training programs has been as emphasis of training programs conducted under the provisions of the Joint Training Partnership Act for years. On March 18, 1992, the Employment and Training Administration and the offices of Vocational and Adult Education jointly issued a notice of public meetings and a request for comments related to occupational skill standards. An occupational skill standard or a *job-related skill standard* has been generally defined as the knowledge, skill, and level of ability needed to satisfactorily perform a given job or occupational competency.

In Texas, Governor Ann Richards has charged the Texas Department of Commerce to establish a Texas Skills Development Program. The purpose of the Texas Skills Development Program is to establish a *statewide method to make sure Texas workers have the skills business and industry need to market Texas goods and services in a global economy.*

The accountability for Perkins II funds used to provide for occupational preparation of students is highlighted by the requirements for a state system of core standards and measures of performance for vocational/technical education programs.

All of the states have developed a system of core standards and measures as required by Perkins II. However, it has been found that few of the states have specifically complied with the act in terms of the requirements of **34 CFR, 403.202** which states:

> **(a) The statewide system of core standards and measures of performance for vocational education programs must include-**
> **(1) Measures of learning and competency gains, including student progress in the achievement of basic and more advanced academic skills;...**

Based on the previous citations, the Act mandates and implies that occupational preparation (vocational) instruction be *competency-based* and be delivered using *competency-based applied learning.*

The use of a *competency-based instruction system* has been found to be the best vehicle by which to deliver *competency-based applied learning.* The use of a competency-based instruction system (CBI) provides for measuring both student learning (progress) and competency attainment (proficiency).

In the PERFORMANCE MEASURES AND CORE STANDARDS FOR POST SECONDARY TECHNICAL EDUCATION PROGRAMS (CBI, 1992), it is stated: "*A measure is a description of an outcome, and a core standard is a desired level or rate of an outcome.*" These definitions are the same, with the exception of the word "**desired,**" as the definitions provided in 34 CFR.

The use of the word "**outcome**" in the definitions of "**measure**" and "**standard**" for Perkins II adds confusion to the definitions since the word "**outcome**" has not been defined and "**competency attainment**" has been given as an example of a core performance measure in section 115.(b)(2) of PL 101-392.

A dictionary review reveals that Webster has defined "**outcome**" as "***something that follows as a result or consequence.***" The word "**consequence**" was defined as "***something produced by a cause or necessarily following from a set of conditions.***"

An educational dictionary defined "**outcome**" as "***change in behavior resulting from learning; not to be confused with objective, which is a desired result.***" After a review of the definition of standards, measures, outcomes, and an example of a measure provided by Perkins II, it is concluded that a measure or a description of an outcome must be written in terms of specific performances expected of a student or program under prescribed conditions. Therefore, core measures, which are descriptions of outcomes, must be written in performance terms of what is expected of : (1) the student in relation to learning progress and competency attainment and (2) the program in relation to program objectives and goals.

Attainment or mastery of an *occupational competency* using criteria of the workplace is considered a core measure of an expected student outcome. The "**learning progress**" could be another core measure description of an expected or established student outcome. In order to determine if the established student outcomes have been attained, it will be necessary to test or assess the student(s).

When a competency-based instruction system is used to deliver the content of a competency-based curriculum, constant feedback from and to students concerning the individual learning progress of students is required. Therefore, students must be evaluated frequently to determine their understanding of knowledge and performance of related tasks. In the test ITEM BANKING MANUAL, Dr. John Carnes[2] stated:

> **On the surface, student testing measures knowledge and skills. In addition, it provides important feedback concerning program accountability. Because test items are easily keyed to job tasks, student evaluation shows which areas of instruction are effective and where improvement is possible.**
>
> **Frequent and immediate feedback to students concerning their progress reinforces good instruction. Item Banking (18) allows rapid generation of student evaluation instruments customized to student progress.**

Test Item Banks are a very good tool for use in identifying and documenting student progress in learning of both academic and occupational skills. Test Item Banks will assist in achieving the Perkins requirement for measures of student learning or progress. Assessing and documenting student attainment of occupational competencies cannot be sufficiently achieved by the use of test items. Competency exams must be used to assess the attainment or mastery of an occupational competency by a student.

The above cited mandates and actions plus the mandates of the **GOALS 2000: EDUCATE AMERICA ACT** serve as notice to vocational/technical educators that they must immediately begin to assess and document vocational/technical students' occupational skill proficiency or occupational competency using occupational competency exams.

The level of skill proficiency or occupational competence of the workforce will be the keystone upon which economic competitiveness in the world will be built. This premise recognizes that the prospective worker must possess personal qualities, occupational preparation, and other qualifications as reported by the **Secretary's Commission on Achieving Necessary Skills (SCANS).**

A great number of states require vocational/technical instruction to be **"competency-based."** However, a review of the literature did not reveal that any state requires the use of performance (competency) exams to assess and document the mastery of occupational competencies by vocational/technical students.

The search of the literature has revealed a limited amount of published information on occupational competency testing. An ERIC search produced only thirteen documents under the descriptor **"occupational competency tests"** and **"occupational competency exams"** or the years of 1966 to 1992. Current literature on testing in vocational education contains a wealth of information on Criteria Referenced Testing, Performance Testing, and Test Item Banking. However, these efforts relate primarily to written tests of occupational knowledge and procedures of performance.

One of the most complete studies of occupational competency testing was made by Panitz and Olivio in their study, ***The State of the Art of Occupational Competency Testing*** in 1970. In their conclusions it was reported:

> The **State of the Art Study** provided crystal clear evidence...
>
> A. That not a single professional testing agency, governmental organization, educational body, labor or management group was satisfied with either the qualitative or quantitative aspects of occupational competency testing;
>
> B. That an exceedingly limited amount of data or experiences relating to occupational competency test development, administration, validation, or research results are recorded; ...

L. That there is a serious lack of data and research activity in occupational competency testing; . . ..

The findings from ***The State of the Art of Occupational Competency Testing*** and other efforts resulted in the creation and maintenance of the National Occupational Competency Testing Institute (NOCTI). NOCTI is now recognized for its work in developing and supervising the administration of occupational exams that provide tradesmen the opportunity to demonstrate the knowledge and skills they have acquired on the job. NOCTI provides occupational competency exams for two specific purposes: (1) examinations are given to vocational teachers or prospective vocational teachers to determine the amount of college credit that a teacher education institution may award an individual for work experience and (2) examinations are given to completers of vocational/technical programs to measure student attainment of the occupational competencies for which the program was designed to develop.

One of the documents referenced in the study by Panitz and Olivio was **OCCUPATIONAL COMPETENCY TEST - PROCEDURES AND INSTRUCTIONS FOR CONSTRUCTION OR REVISION**, developed and published by the Ohio State Department of Education in 1962. This document emphasized the importance of using the results of an occupational analysis to determine the skills and technical knowledge needed by a worker in the specific occupation for which the occupational competency test(s) are being prepared. The Ohio document highlighted the need for using the results of occupational analysis in test development in the statement:

> ***"The manipulative processes to be tested should be selected carefully so that enough basic skills will be required to show mastery of the occupation."***

During the period of 1979-1982, the American Institute for Research, under contract with the Office of Vocational and Adult Education, U.S. Department of Education,

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developed a series of instructional modules for the purpose of providing a national model for vocational competency test development. The Vocational Competency Measures (VCM) project developed and made available for dissemination twenty instructional modules designed to assist individuals in the development of competency tests.

All of the three references cited above (NOCTI, VCM modules, and the Ohio document) describe the development and use of written (cognitive) and performance exams. The most common form of testing is the use of cognitive tests. It is advocated that cognitive testing can assess whether a student (or worker) knows how to do a task (skill standard) or competency. It is also felt by proponents of cognitive tests that they are the only way by which an assessment can be made of communication skills, computational skills, and occupational theory. Most educators feel that cognitive tests are the most useful and practical means to assess occupational or job knowledge.

Performance tests have been used in occupational (vocational/technical) preparation programs to assess a student's psychomotor activities that are expected to be performed in the workplace. In the past, performance tests have been structured in the form of a simulation of a work situation. The performance tests or exams have normally been used for assessing performance in terms of process and products. Assessing performance based on the products produced is often the easier of the assessments because the examiner evaluates the results of the work performed. Products can be evaluated or measured against specific criteria or standards. An assessment of process involves the observation and evaluation of behaviors and activities performed while a service is being provided.

The procedures for developing and administering occupational competency exams (tests) have been field tested and validated. The development and administration procedures used for assessing occupational competencies found in the review of the literature use a common process regardless of the examples given by the researchers and developers. However, none of the literature reviewed propose that the knowledge or theory of the occupation can be assessed by a performance exam. To conclude that occupational knowledge must be assessed using a written (cognitive) test is contradictory to the process used in the workplace to assess an employee's performance in relation to job maintenance, promotion, or salary increases. There is an increased emphasis for students in occupational preparation programs to have demonstrated proficiency or mastery of occupational competencies of the workplace. Demonstration of occupational competencies can be made by the process of competency assessment by measuring performance with a set of standards or criteria established for the occupation by the workplace. The standards or criteria must be established as core for the occupation and not specifically for any individual employer, company, or corporation.

In reviewing the literature on occupational competency exams (tests) it was found that, similar to other publications and papers related to competency-based education, competency-based curricula, and competency-based instruction, no one had defined the term **"occupational competency."** Researching and developing anything related to occupational competency without defining the term **"occupational competency"** is similar to teaching a class and not informing students of what they will be able to do after the instruction has been completed.

Based on the previous narrative, it is evident that there has been beneficial research and development actives related to the construction and administration of competency exams. It is also evident that previous works in the area off occupational competency exams has been done without a definition of occupational competency. Until the term **"occupational competency"** has been defined the term **"skill standard"** could be used and assessments would be developed for determining attainment or mastery of skill standards.

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Discussions with instructors of Electronic Technician programs revealed that current testing instruments used by public Texas community and technical colleges are more appropriate and used for evaluating student progress than for assessment of student attainment of industry identified skill standards and competencies. This determination was made on the basis that criteria used in assessing performance of the skill standard had not been obtained and/or validated by representatives of business/industry.

The review of the literature revealed that the **National Occupational Competency Testing Institute** is the only recognized national organization that has prepared and disseminates student occupational competency achievement tests designed as exit measures for completers of vocational/technical education programs.

Occupational Competency Exams in the field of electronics available from the National Occupational Competency Institute (NOCTI) include the following by Code of Instructional Programs (CIP);

CIP Code #	Program Title
15.0302	Electrical Technology
15.0403	Electrical Mechanical Technology
15.0303	Electronic Technology
47.0105	Industrial Electronics

A review of the most recent materials from NOCTI indicated that the program exit assessment consisted of a test of cognitive skills (35-60 minutes), a test of technical information (3 hours), and performance tests of 3-4 hours.

During the 1992-1993 academic year, Paris Junior College conducted a project, under the direction of David Ingram, for developing a model for "*Developing and Administering Occupational Competency Exams*". The project was funded by the Texas Higher Education

Coordinating Board using Carl Perkins, Title IIA funds. It was anticipated that a second year project would be funded to provide inservice training of postsecondary vocational/technical personnel to prepare them with skills identified in the model to develop and administer occupational competency exams. Examples of competency exams for electronic technicians developed using the model as a guide are presented in **Appendix A.** The model for developing occupational competency exams uses only performance exams. The use of only performance exams for program exit measures was based on the premise that cognitive skills and technical knowledge needed to perform the competency or skill standards could be measured in a properly prepared performance exam.

A review of a *"Practice CET Test"* used in the process of certifying electronic technicians by the International Society of Electronic Technicians revealed that the associate-level test is a **"paper-pencil"** test.

CONCLUSIONS: Based on the content of the **Introduction** and the **Findings** presented, the following conclusions have been made:

1. Occupational preparation programs accountability has been mandated for occupational preparation programs that use public funds;
2. A National Skill Standards Board is to be established to stimulate and support the adoption of a voluntary national system to assist in carrying out the mandate for accountability;
3. The assessment and test instruments currently being used by public community and technical colleges in Texas are not appropriate for use as exit measures for program completers;
4. The availability of commercially prepared assessment instruments designed as exit measures of skill standards is limited;
5. Assessment or test instruments are needed for evaluating student progress and competency attainment; and
6. Electronic instructors should be provided training in the development and administration of occupational competency/skill standards exams.

RECOMMENDATIONS:

In order to prepare for and meet the requirements of accountability for electronic technician programs the following recommendations are made for consideration by the staff of the Texas Skills Development Program of the Texas Department of Commerce and the Community and Technical Colleges Division staff of the Texas Higher Education Coordinating Board:

1. It is recommended that the appropriate State agencies provide for staff development activities that will provide postsecondary electronic instructors with instruction designed to:
   a) prepare them to deliver the electronic technician curricula using a competency-based instructional system;
   b) develop and administer occupational competency exams; and
   c) update the technical skills and knowledge of the instructors.
2. It is recommended that the electronic engineering technician curricula be enhanced by the development of basic course outlines to provide for a greater assurance that the SCANS competencies and foundations are included in courses that are a core for the electronic curricula in all Texas public community and technical colleges.
3. It is recommended that a project be funded to initiate the development of assessment instruments, using the model developed by Paris Junior College, that will measure the development of the skill standards and the SCANS skills of the electronic engineering technician curriculum in Texas public postsecondary programs.
4. It is recommended that the Texas Tri-Agency Partnership conduct or fund a study to determine the feasibility and procedures necessary for including performance exams in the exam procedures of a nationally recognized certifying organization for electronic technicians such as the International Society of Certified Electronic Technicians.

BIBLIOGRAPHY

1. Department of Education, 34 CFR Part 400, et al., *State Vocational and Applied Technology Education Programs and National Discretionary Programs of Vocational Education; Proposed Rule.*, 1991.

2. Carnes, John, *Item Banking Manual*, Northeast Texas Community College, Funded by Texas Higher Education Coordinating Board.

APPENDIX A

EXAMPLES OF COMPETENCY EXAMS

Developed by

Paris Junior College

STUDENT MANUAL

COMPETENCY EXAMINATION

COMPETENCY:

DETERMINING ALTERNATING CURRENT TIME-FREQUENCY VOLTAGE MEASUREMENT

ELECTRONICS / INSTRUMENTATION OCCUPATIONS

DEVELOPED BY

MR. JAMES MATSON - ELECTRONICS

INSTRUCTOR

VICTORIA INDEPENDENT SCHOOL DISTRICT

AND

MR. TAD STOKES - ELECTRONIC INSTRUMENTATION

INSTRUCTOR

VICTORIA COLLEGE

FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE STUDENT

Competency: Determining Alternating Current Time-Frequency-Voltage Measurement.

Performance Objective: Given the proper tools and equipment, the student will demonstrate the ability to measure the time, frequency, and voltage from an oscilloscope display to current I.S.A. standards, achieving 100% mastery on the performance test.

1) The exam consists of five tasks.

2) You will be rated on your ability to perform each of the tasks, to current I.S.A. standards.

3) The maximum time allowed for the exam is 20 minutes.

4) When instructed by the examiner, return the work station to its pretest condition.

5) The student exam booklet, any scrap worksheets, and all equipment must be turned in to the examiner and checked before you are given permission to leave the exam area.

Materials Needed:

Variable A.C. generator
Oscilloscope
Calculator

Time started: __________
Time finished: __________

COMPETENCY EXAMINATION

DETERMINING ALTERNATING CURRENT
TIME FREQUENCY-VOLTAGE MEASUREMENT

PERFORMANCE EXAM:

TASK 1 PERIOD MEASUREMENT

1) Randomly set the generator value.
2) Attach the oscilloscope leads.
3) Adjust the Time/Division controls until a useable sine wave appears on screen.
4) Measure and record the period.

TASK 2 FREQUENCY MEASUREMENT

1) Using the sine wave displayed for TASK 1 measure and record the frequency of the sine wave.

TASK 3 PEAK TO PEAK VOLTAGE MEASUREMENT

1) Using the sine wave displayed and the VOLTS/DIVISION controls, measure and record the PEAK TO PEAK voltage displayed.

TASK 4 PEAK VOLTAGE MEASUREMENT

1) Using the sine wave displayed and the VOLTS/DIVISION controls, measure and record the PEAK VOLTAGE.

TASK 5 RMS VOLTAGE CALCULATIONS

1) Using the value measured in TASK 4 calculate and record the RMS voltage the sine wave represents.

EXAMINER MANUAL

COMPETENCY EXAMINATION

COMPETENCY:

DETERMINING ALTERNATING CURRENT TIME-FREQUENCY VOLTAGE MEASUREMENT

ELECTRONICS / INSTRUMENTATION OCCUPATIONS

DEVELOPED BY

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AND
MR. TAD STOKES - ELECTRONIC INSTRUMENTATION
INSTRUCTOR
VICTORIA COLLEGE

FOR
PARIS JUNIOR COLLEGE
JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE EXAMINER

Competency: Determining Alternating Current Time-Frequency-Voltage Measurement.

Performance Objective: Given the proper tools and equipment, the student will demonstrate the ability to measure the time, frequency, and voltage from an oscilloscope display to current I.S.A. standards, achieving 100% mastery on the performance test.

1) The maximum time allowed for the exam is 20 minutes.

2) There are five tasks that the student must perform.

3) Prepare according to given instruction or formula.

4) Upon completion of the exam, verify that all testing materials and equipment have been returned to pretest condition.

5) Clarify any questions before the exam begins.

6) Record all ratings on the individual student competency rating sheet.

Materials Needed:

Variable A.C. generator
Oscilloscope
Calculator

Time started: __________
Time finished: __________

COMPETENCY EXAMINATION RATING SHEET

Competency: Determining Alternating Current Time-Frequency-Voltage Measurement.

Performance Objective: Given the proper tools and equipment, the student will demonstrate the ability to measure the time, frequency, and voltage from an oscilloscope display to current I.S.A. standards, achieving 100% mastery on the performance test.

STUDENT ____________________ Competency Mastered YES ____ NO ____

EXAMINER ____________________ Date of Rating ____________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE		
	Satisfactory	No. of Attempts	Completion Date
1. Period measurement.			
2. Frequency measurement.			
3. Peak to peak voltage measurement.			
4. Peak voltage measurement.			
5. RMS voltage calculation.			

Comments:

COMPETENCY EXAMINATION

DETERMINING ALTERNATING CURRENT TIME-FREQUENCY-VOLTAGE MEASUREMENT

PERFORMANCE EXAM:

TASK 1 PERIOD MEASUREMENT

1) Randomly set the generator value.
2) Attach the oscilloscope leads.
3) Adjust the Time/Division controls until a useable sine wave appears on screen.
4) Measure and record the period.

TASK 2 FREQUENCY MEASUREMENT

1) Using the sine wave displayed for TASK 1 measure and record the frequency of the sine wave.

TASK 3 PEAK TO PEAK VOLTAGE MEASUREMENT

1) Using the sine wave displayed and the VOLTS/DIVISION controls, measure and record the PEAK TO PEAK voltage displayed.

TASK 4 PEAK VOLTAGE MEASUREMENT

1) Using the sine wave displayed and the VOLTS/DIVISION controls, measure and record the PEAK VOLTAGE.

TASK 5 RMS VOLTAGE CALCULATIONS

1) Using the value measured in TASK 4 calculate and record the RMS voltage rhe sine wave represents.

STUDENT MANUAL

COMPETENCY EXAMINATION
FOR
ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED
TEST SEMICONDUCTORS DIODES AND BIPOLAR JUNCTION TRANSISTORS, TO IDENTIFY DEFECTS

DEVELOPED BY
MR. TAD STOKES - ELECTRONIC / INSTRUMENTATION INSTRUCTOR
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AND
MR. JAMES MATSON - ELECTRONICS INSTRUCTOR
VICTORIA INDEPENDENT SCHOOL DISTRICT
FOR
PARIS JUNIOR COLLEGE
JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE STUDENT

Competency: Test Semiconductors Diodes and Bipolar Junction Transistors, to Identify Defects.

Performance Objective: Demonstrate the ability to test semiconductors diodes and bipolar junction transistors,to identify defects according to departmental standards, achieving ________ % mastery on the performance test.

1) This exam consists of three tasks:

   a. General Knowledge of Semiconductors
   b. Testing Semiconductor Diodes
   c. Testing Bipolar Junction Transistors

2) You will be rated on your ability to perform each of the tasks, to established departmental standards.

3) The maximum time allowed for the exam is one hour.

4) When instructed by the examiner, return the work station to its pretest condition.

5) The student exam booklet, any scrap worksheets, and all equipment must be returned to the examiner before you are allowed to leave the test area. The results of the exam will be discussed at the conclusion of the exam.

6) After you have read these instructions inform the examiner that you are ready to begin the exam.

Materials Needed:
1 DMM
3 General Purpose Diodes
3 Bipolar Junction Transistors

Time started: _________
Time finished: _________

COMPETENCY EXAM
ON
SEMICONDUCTORS DIODES AND BIPOLAR JUNCTION TRANSISTORS TO IDENTIFY DEFECTS

PERFORMANCE EXAM:

TASK 1 ANSWER THE FOLLOWING QUESTIONS TO TEST YOUR GENERAL KNOWLEDGE OF SEMICONDUCTORS

1) Identify the cathode end of a diode.

2) Identify the emitter lead of a transistor.

3) T F zener diodes can identified just by looking at them.

4) How many resistance measurements must be made to test a transistor?

TASK 2 TEST EACH DIODE AT THE WORK STATION, INDICATE THE CONDITION OF THE DEVICE AS GOOD OR BAD IN THE SPACE PROVIDED.

1) Diode #1 forward resistance _________ Reverse Resistance ________

Condition of Component Good Bad

If the component checks bad, what type of defect is indicated?

2) Diode #2 forward resistance _________ Reverse Resistance ________

Condition of Component Good Bad

If the component checks bad, what type of defect is indicated?

3) Diode #3 forward resistance _________ Reverse Resistance ________

If the component checks bad, what type of defect is indicated?

TASK 3 TEST EACH TRANSISTOR AT THE WORK STATION. RECORD THE READINGS IN THE SPACE PROVIDED. INDICATE THE CONDITION OF THE COMPONENT AS GOOD OR BAD. IF THE DEVICE IS DEFECTIVE, INDICATE THE NATURE OF THE DEFECT.

TRANSISTOR #1

EB-Forward Resistance ________
EB-Reverse Resistance ________
CB-Forward Resistance ________
CB-Reverse Resistance ________
CE-_______ Resistance ________

Component Condition Good Bad Nature of Defect if Bad ________

TRANSISTOR #2

EB-Forward Resistance ________
EB-Reverse Resistance ________
CB-Forward Resistance ________
CB-Reverse Resistance ________
CE_______ Resistance ________

Component Condition Good Bad Nature of Defect if Bad ________

TRANSISTOR #3

EB-Forward Resistance ________
EB-Reverse Resistance ________
CB-Forward Resistance ________
CB-Reverse Resistance ________
CE-_______ Resistance ________

Component Condition Good Bad Nature of Defect if Bad ________

COMPETENCY EXAM RATING SHEET
FOR
TESTING SEMICONDUCTORS DIODES AND BIPOLAR JUNCTION TRANSISTORS, TO IDENITFY DEFECTS

Performance Objective: Demonstrate the ability to test semiconductors diodes and bipolar junction transistors, to identify defects according to departmental standards, achieving ________% mastery on the performance test.

STUDENT ______________________________ Competency Mastered YES ____ NO ____

EXAMINER ______________________________ Date of Rating ______________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE	
	Satis-factory	Unsat-isfactory
1. Identify the cathode end of a diode, the emitter lead of a transistor and zener diodes.		
2. Testing semiconductor diodes.		
3. Testing bipolar junction transistors.		

Comments:

EXAMINER MANUAL

COMPETENCY EXAMINATION
FOR
ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED

TEST SEMICONDUCTORS DIODES AND BIPOLAR

JUNCTION TRANSISTORS, TO IDENTIFY DEFECTS

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JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE EXAMINER

Competency: Test Semiconductors Diodes and Bipolar Junction Transistors, to Identify Defects.

Performance Objective: Demonstrate the ability to test semiconductors diodes and bipolar junction transistors, to identify defects according to departmental standards, achieving ________ % mastery on the performance test.

1) Maximum time for the exam is one hour.

2) This exam consists of three tasks:

   a. General Knowledge of Semiconductors
   b. Testing Semiconductor Diodes
   c. Testing Bipolar Junction Transistors

3) Documentation of ratings should be made on individual competency exam rating sheet and transferred to the student's competency profile.

4) Examiner must initial the worksheet at the completion of each task.

5) When the student notifies you that she/he has read their instructions, you will record the starting time.

6) For each task, rate the student performance as satisfactory or unsatisfactory on the exam rating sheet. Rating information should be shared with the student upon completion of all parts of the exam.

7) Upon completion of the exam verify that all testing materials are in your possession.

Materials Needed:

1 DMM
3 General Purpose Diodes
3 Bipolar Junction Transistors

Time started ________
Time finished ________

COMPETENCY EXAM
ON
SEMICONDUCTORS DIODES AND BIPOLAR JUNCTION TRANSISTORS, TO IDENTIFY DEFECTS

PERFORMANCE EXAM:

TASK 1 ANSWER THE FOLLOWING QUESTIONS TO TEST YOUR GENERAL KNOWLEDGE OF SEMICONDUCTORS

1) Identify the cathode end of a diode.

2) Identify the emitter lead of a transistor identified.

3) T F zener diodes can identified just by looking at them.

4) How many resistance measurements must be made to test a transistor?

TASK 2 TEST EACH DIODE AT THE WORK STATION, INDICATE THE CONDITION OF THE DEVICE AS GOOD OR BAD IN THE SPACE PROVIDED.

1) Diode #1 forward resistance ________ Reverse Resistance ________

Condition of Component **Good** **Bad**

If the component checks bad, what type of defect is indicated?

2) Diode #2 forward resistance ________ Reverse Resistance ________

Condition of Component **Good** **Bad**

If the component checks bad, what type of defect is indicated?

3) Diode #3 forward resistance ________ Reverse Resistance ________

If the component checks bad, what type of defect is indicated?

TASK 3 TEST EACH TRANSISTOR AT THE WORK STATION. RECORD THE READINGS IN THE SPACE PROVIDED. INDICATE THE CONDITION OF THE COMPONENT AS GOOD OR BAD. IF THE DEVICE IS DEFECTIVE, INDICATE THE NATURE OF THE DEFECT.

TRANSISTOR #1

EB-Forward Resistance __________
EB-Reverse Resistance __________
CB-Forward Resistance __________
CB-Reverse Resistance __________
CE-_______ Resistance __________

Component Condition Good Bad Nature of Defect if Bad ____

TRANSISTOR #2

EB-Forward Resistance ________
EB-Reverse Resistance ________
CB-Forward Resistance ________
CB-Reverse Resistance ________
CE________ Resistance ________

Component Condition Good Bad Nature of Defect if Bad ____

TRANSISTOR #3

EB-Forward Resistance ________
EB-Reverse Resistance ________
CB-Forward Resistance ________
CB-Reverse Resistance ________
CE-_______ Resistance ________

Component Condition Good Bad Nature of Defect if Bad ____

STUDENT MANUAL

COMPETENCY EXAMINATION

FOR

ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED

SELECTION OF COMPONENTS, CIRCUIT CONSTRUCTION,

MEASUREMENT OF RESISTANCE,

VOLTAGE, AND CURRENT IN PARALLEL CIRCUITS

DEVELOPED BY

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FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS TO THE STUDENT

Competency: Selection of components, circuit construction, measurement of resistance, voltage, and current in parallel circuits.

Performance Objective: The student will demonstrate the ability to select components, construct a parallel circuit, and measure resistance, voltage, and current in the parallel circuit, to departmental standards, achieving ________ % mastery on the perform test.

1) This exam consists of six tasks:

   a. Theoretical Calculations
   b. Selection of Components
   c. Resistance Measurement
   d. Voltage Measurement
   e. Total Current Measurement
   f. Branch Current Measurement

2) For each task you will be rated on your ability to perform each of the six tasks to departmental standards.

3) The maximum time allowed for this exam is one hour.

4) This student performance test, scratch paper, and worksheets must be returned to the examiner before you are allowed to leave the room. Results of this exam will be discussed with you at its conclusion.

5) After you have read these instructions. Inform the examiner that you area ready to begin this exam. You will have one hour from that point.

Materials Needed:

1 DMM
1 Parts Kit
Red and Black Hook-Up Wire
Variable D.C. Power Supply
Breadboard To Construct Circuit Upon

Time started:_______
Time finished:______

COMPETENCY EXAM
FOR
SELECTION OF COMPONENTS, CIRCUIT CONSTRUCTION, MEASUREMENT OF RESISTANCE, VOLTAGE, AND CURRENT IN PARALLEL CIRCUITS

PERFORMANCE EXAM:

TASK 1 CALCULATE THEORETICAL VALUES OF RT, IT, IR, IR2, AND IRS USING COLOR CODE VALUES OF THE RESISTORS AND POWER SUPPLY VALUE ON THE SCHEMATIC DIAGRAM (FIG. 1)

1) Calculate the following values showing all work:

RT ________ IR1 ________ IR3 ________

IT ________ IR2 ________

2) When you have completed this task inform the examiner.

TASK 2 SELECTION OF COMPONENTS FROM PARTS KITS

1) Using the parts kit provided select the correct components to construct the parallel circuit in Fig. 1 of this exam.

2) When you have completed this task notify the examiner.

TASK 3 USE A DMM TO CORRECTLY MEASURE THE ACTUAL VALUE OF R1, R2, AND R3

1) Measure and record the value of R1, R2, and R3.

R1 ________ within tolerance YN

R2 ________ within tolerance YN

R3 ________ within tolerance YN

2) When you have completed this task, inform the examiner.

TASK 4 CONSTRUCT THE CIRCUIT IN ACCORDANCE WITH FIG. 1 AND SET POWER SUPPLY VOLTAGE USING A DMM

1) Using the components selected, construct the circuit in Fig. 1 on the experimenter board and using a DMM adjust power supply to the correct value of voltage as required by the schematic diagram.

2) When you have completed this task, inform the examiner.

TASK 5 INSTALL AN AMMETER TO MEASURE TOTAL CURRENT CURRENT

1) Install an ammeter to measure total current at point A on the schematic diagram.

2) Energize the circuit and record the value in the space provided.

IT = _________

3) Have examiner check your work before removing power from the circuit.

4) When instructed by the examiner go on to the next task.

TASK 6 USE A DMM TO MEASURE BRANCH CURRENT

1) Install an ammeter to measure the current flow through R3.

2) Record the measured value in the space provided. I3______

3) Have examiner check your work before removing power from the circuit.

4) This completes this performance test. Return the work station to its pretest condition.

a. Unplug the Trainer
b. Return Power Supply to its Minimum Value
c. Return Parts to Parts Kits

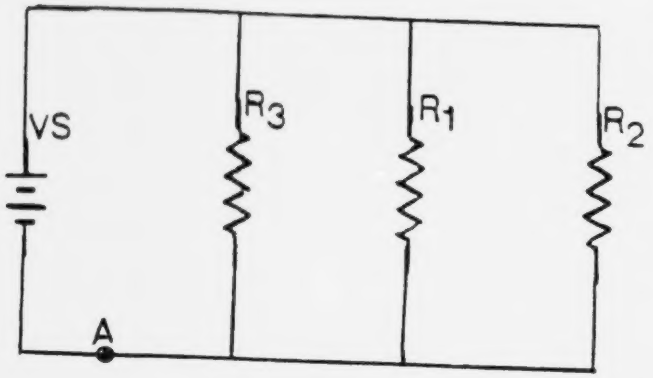


FIG. 1

COMPETENCY EXAM RATING SHEET
FOR
DIRECT CURRENT PARALLEL CIRCUIT ANALYSIS

Performance Objective: The student will demonstrate the ability to select components, construct a parallel circuit, and measure resistance, voltage, and current in a parallel circuit, to departmental standards, achieving_______% mastery on the performance test.

STUDENT ____________________________ Competency Mastered YES ____ NO ____

EXAMINER ____________________________ Date of Rating ____________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE	
	Satis-factory	Unsat-isfactory
1. Ability to perform theoretical calculations.		
2. Ability to select correct components.		
3. Ability to make resistance measurements.		
4. Ability to make voltage measurements.		
5. Ability to measure total current.		
6. Ability to measure specific branch current.		

Comments:

EXAMINER MANUAL

COMPETENCY EXAMINATION

FOR

ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED

SELECTION OF COMPONENTS, CIRCUIT CONSTRUCTION, MEASUREMENT OF RESISTANCE, VOLTAGE, AND CURRENT IN PARALLEL CIRCUITS

DEVELOPED BY

MR. TAD STOKES - ELECTRONIC / INSTRUMENTATION
INSTRUCTOR
VICTORIA COLLEGE

AND

MR. JAMES MATSON - ELECTRONICS INSTRUCTOR
VICTORIA INDEPENDENT SCHOOL DISTRICT

FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS TO THE EXAMINER

Competency: Selection of components, circuit construction, measurement of resistance, voltage, and current in parallel circuits.

Performance Objective: The student will demonstrate the ability to select components, construct a parallel circuit, and measure resistance, voltage, and current in the parallel circuit, to departmental standards, achieving ________ % mastery on the perform test.

1) The maximum time allowed for this exam is one hour.

2) This exam consists of six task:

   a. Theoretical Calculations
   b. Selection of Components
   c. Resistance Measurement
   d. Voltage Measurement
   e. Total Current Measurement
   f. Branch Current Measurement

3) The results of this exam will become a part of the students competency profile record.

4) When the student notifies you he/she has read the instructions, you will record the start time of the exam.

5) For each job, you will record the results of each task on the rating sheet as satisfactory or unsatisfactory. Rating information should not be shared with the student until all parts of the exam are completed.

6) When all students have been tested and all testing materials are in your possession, return all testing materials to the electronics office.

Materials Needed:

1 DMM
1 Parts Kit
Red and Black Hook-Up Wire
Variable D.C. Power Supply
Breadboard To Construct Circuit Upon

Time started:______
Time finished:______

COMPETENCY EXAM
FOR
SELECTION OF COMPONENTS, CIRCUIT CONSTRUCTION, MEASUREMENT OF RESISTANCE, VOLTAGE, AND CURRENT IN PARALLEL CIRCUITS

PERFORMANCE EXAM:

TASK 1 **CALCULATE THEORETICAL VALUES OF RT, IT, IR, IR2, AND IRS USING COLOR CODE VALUES OF THE RESISTORS AND POWER SUPPLY VALUE ON THE SCHEMATIC DIAGRAM (FIG. 1)**

1) Calculate the following values showing all work:

RT __________ IR1 __________ IR3 __________

IT __________ IR2 __________

2) When you have completed this task inform the examiner.

TASK 2 **SELECTION OF COMPONENTS FROM PARTS KITS**

1)Using the parts kit provided select the correct components to construct the parallel circuit in fig. 1 of this exam.

2) When you have completed this job notify the examiner.

TASK 3 **USE A DMM TO CORRECTLY MEASURE THE ACTUAL VALUE OF R1, R2, AND R3**

1) Measure and record the value of R1, R2, and R3.

R1 __________ within tolerance YN

R2 __________ within tolerance YN

R3 __________ within tolerance YN

2) When you have completed this task, inform the examiner.

TASK 4 **CONSTRUCT THE CIRCUIT IN ACCORDANCE WITH FIG. 1 AND SET POWER SUPPLY VOLTAGE USING A DMM**

1) Using the components selected, construct the circuit in Fig. 1 on the experimenter board and using a DMM adjust power supply to the correct value of voltage as required by the schematic diagram.

2) When you have completed this task, inform the examiner.

TASK 5 INSTALL AN AMMETER TO MEASURE TOTAL CURRENT

1) Install an ammeter to measure total current at point A on the schematic diagram.
2) Energize the circuit and record the value in the space provided.
IT = _________
3) Have examiner check your work before removing power from the circuit.

4) When instructed by the examiner go on to the next task.

TASK 6 USE A DMM TO MEASURE BRANCH CURRENT

1) Install an ammeter to measure the current flow through R3.
2) Record the measured value in the space provided. I3______
3) Have examiner check your work before removing power from the circuit.

4) This completes this performance test. Return the work station to its pretest condition.
a. Unplug the Trainer
b. Return Power Supply to its Minimum Value
c. Return Parts to Parts Kits

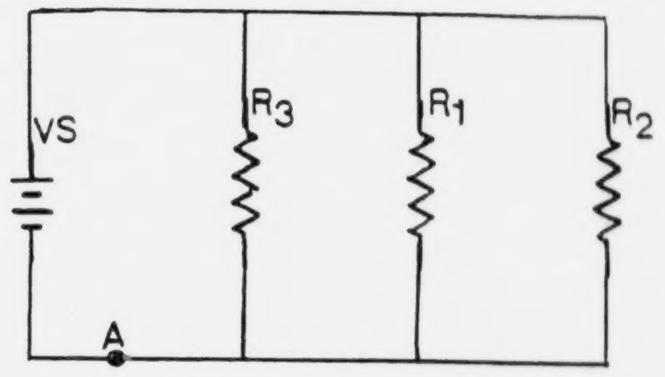


FIG. 1

STUDENT MANUAL

COMPETENCY EXAMINATION
FOR
ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED

CONSTRUCT A DIRECT CURRENT SERIES CIRCUIT

DEVELOPED BY

MR. JAMES MATSON - ELECTRONICS INSTRUCTOR
VICTORIA INDEPENDENT SCHOOL DISTRICT

AND

MR. TAD STOKES - ELECTRONIC / INSTRUMENTATION INSTRUCTOR
VICTORIA COLLEGE

FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE STUDENT

Competency: Construct a Direct Current Series Circuit

Performance Objective: Given lecture, textbook study, and class activities on problem solving, the student will demonstrate the ability to construct a direct current series circuit to current industry standards, achieving ______ % mastery on the performance test.

1) This test consists of nine jobs.

2) You will be rated on your ability to perform each of the jobs, to current I.S.A. standards.

3) The maximum time allowed for this test is one hour. Each procedure therefore should take no longer than the time specified on the job sheet.

4) When instructed by the examiner, return the work station to its pretest condition.

5) The Student Test booklet, any scrap worksheets, and all equipment must be turned in to the examiner and checked before you are given permission to leave the test area.

Materials Needed:

Schematic Diagram
Assorted Resistors
Job Sheet
Scientific Calculator
Pencil
Digital Multi-Meter
Breadboard
Variable Power Supply
Jumper Wire

Time started: __________
Time finished: __________

COMPETENCY EXAM TO CONSTRUCT A DIRECT CURRENT SERIES CIRCUIT

PERFORMANCE TEST

JOB #1 **READ SCHEMATICS AND RESISTOR SELECTION**

Estimated time: 5 minutes

1) Refer to figure 1 and select R1, R2, and R3 from assorted resistors.

Time started: ____________

Time finished: ____________

JOB #2 **RESISTOR COLOR CODE AND OHMS LAW CALCULATIONS**

Estimated time: 10 minutes

1) Using color code values and Ohms Law, calculate the value for:

a) Total resistance = ______________

b) Total current = ______________

c) Voltage drop for resistor 1 = ____________

d) Voltage drop for resistor 2 = ____________

e) Voltage drop for resistor 3 = ____________

Time started: __________

Time finished: _________

JOB #3 **MEASURING RESISTANCE**

Estimated time: 5 minutes

1) Using a digital multi-meter measure and record the actual values for:

a) Resistor 1 = __________

b) Resistor 2 = __________

c) Resistor 3 = __________

Time started: ___________

Time finished: ___________

JOB #4 **CIRCUIT CONSTRUCTION AND MEASURING RESISTANCE**

Estimated time: 5 minutes

1) Construct the circuit in Figure 1 and measure the total resistance:

a) Total resistance = __________

Time started: __________

Time finished: __________

JOB #5 **MEASURING VOLTAGE AND CURRENT**

Estimated time: 10 minutes

1) Apply power to the breadboard and adjust the power supply for 10 volts D.C.

2) Measure and record current values at:
  a) point a= ___________
  b) point b = ___________
  c) point c = ___________
  d) point d = ___________
Time started: __________
Time finished: __________

JOB #6 MEASURING VOLTAGE DROPS

Estimated time: 5 minutes
1) Energize the circuit and measure:
  a) Voltage drop across resistor 1 = __________
  b) Voltage drop across resistor 2 = __________
  c) Voltage drop across resistor 3 = __________
Time started: __________
Time finished: __________

JOB #7 MEASURING CURRENT

Estimated time: 10 minutes
1) Increase the total voltage to 15 volts and measure the new value of current:
  a) Total current at 15 volts = ___________
2) Decrease the total voltage to 5 volts and measure the new value of current:
  a) Total current at 5 volts = ___________
Time started: __________
Time finished: __________

JOB #8 VERIFICATION OF OHMS LAW

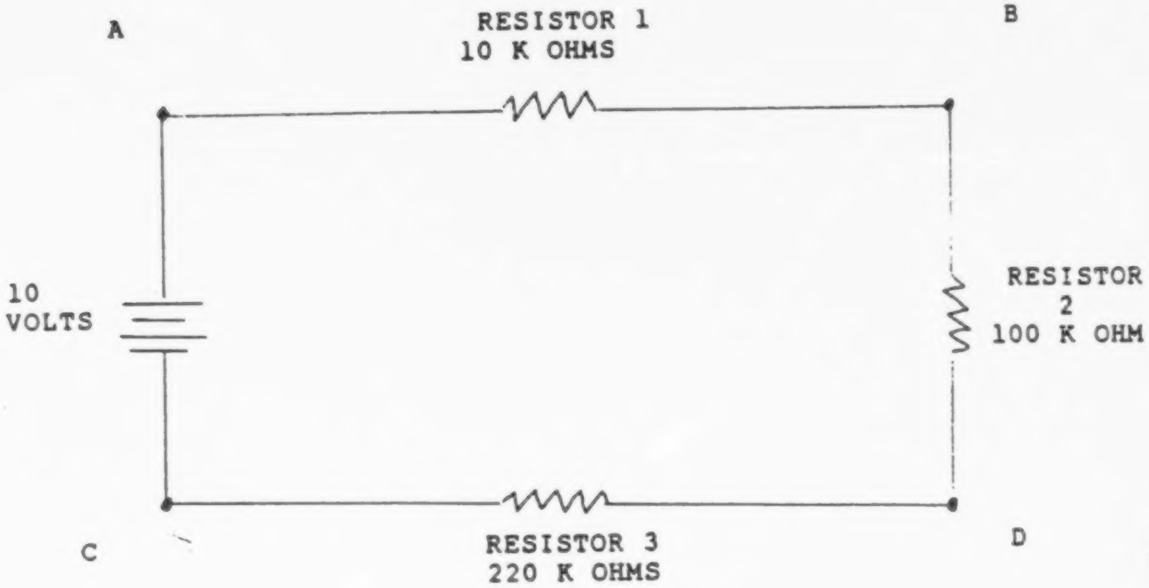
Estimated time: 5 minutes
1) Explain the difference between the two current readings obtained in JOB #7.

Time started:_______
Time finished:_______

JOB #9 CALCULATING POWER

Estimated time: 5 minutes
1) Calculate power using the measured values of voltage and current for the circuit:
  a) Power across resistor 1 = __________
  b) Power across resistor 2 = __________
  c) Power across resistor 3 = __________
  d) Total power
Time started: __________
Time finished: __________

FIGURE 1


A
RESISTOR 1
10 K OHMS
B
10
VOLTS
RESISTOR
2
100 K OHM
C
RESISTOR 3
220 K OHMS
D

COMPETENCY EXAM RATING SHEET
FOR
CONSTRUCT A DIRECT CURRENT SERIES, CIRCUIT

Performance Objective: Demonstrate the ability to construct a direct current series circuit, to current industry standards, achieving ________ % mastery on the performance test.

STUDENT ____________________________ Competency Mastered YES ____ NO ____

EXAMINER ____________________________ Date of Rating ______________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE	
	Satisfactory	Unsatisfactory
1. Demonstrated ability to read schematics and resistor selection.		
2. Utilize resistor color code and OHMS law for calculations.		
3. Measures resistance.		
4. Circuit construction and measuring resistance.		
5. Measures voltage and current.		
6. Measures voltage drops.		
7. Measures current.		
8. Verification of OHMS law.		
9. Calculates power using the measured values of voltage and current for the circuit.		

Comments:

EXAMINER MANUAL

COMPETENCY EXAMINATION

FOR

ELECTRONICS/INSTRUMENTATION OCCUPATIONS

COMPETENCY TO BE EXAMINED

CONSTRUCT A DIRECT CURRENT SERIES CIRCUIT

DEVELOPED BY

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INSTRUCTOR
VICTORIA COLLEGE

FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE EXAMINER

Competency: Construct a Direct Current Series Circuit

Performance Objective: Demonstrate the ability to construct a direct circuit series, to current industry standards, achieving 100% mastery on the performance test.

1) Maximum time for test is one hour.
2) There are nine tasks that the student must perform.
3) Documentation of ratings should be made on individual competency exam rating sheet.
4) Upon completion of the exam, verify that all testing materials are in your possession.

Equipment Needed:

Schematic Diagram
Assorted Resistors
Job Sheet
Scientific Calculator
Pencil
Digital Multi-Meter
Breadboard
Variable Power Supply
Jumper Wire

Time started: __________
Time finished: __________

COMPETENCY EXAM TO CONSTRUCT A DIRECT CURRENT SERIES CIRCUIT

PERFORMANCE TEST

JOB #1 READ SCHEMATICS AND RESISTOR SELECTION

Estimated time: 5 minutes

1) Refer to figure 1 and select R1, R2, and R3 from assorted resistors.

Time started: ____________

Time finished: ____________

JOB #2 RESISTOR COLOR CODE AND OHMS LAW CALCULATIONS

Estimated time: 10 minutes

1) Using color code values and Ohms Law, calculate the value for:
  - a) Total resistance = ________________
  - b) Total current = ________________
  - c) Voltage drop for resistor 1 = ________________
  - d) Voltage drop for resistor 2 = ________________
  - e) Voltage drop for resistor 3 = ________________

Time started: __________

Time finished: __________

JOB #3 MEASURING RESISTANCE

Estimated time: 5 minutes

1) Using a digital multi-meter measure and record the actual values for:
  - a) Resistor 1 = ___________
  - b) Resistor 2 = ___________
  - c) Resistor 3 = ___________

Time started: ____________

Time finished: ____________

JOB #4 CIRCUIT CONSTRUCTION AND MEASURING RESISTANCE

Estimated time: 5 minutes

1) Construct the circuit in Figure 1 and measure the total resistance:
  - a) Total resistance = ___________

Time started: __________

Time finished: __________

JOB #5 MEASURING VOLTAGE AND CURRENT

Estimated time: 10 minutes

1) Apply power to the breadboard and adjust the power supply for 10 volts D.C.

2) Measure and record current values at:
a) point a= __________
b) point b = __________
c) point c = __________
d) point d = __________
Time started: __________
Time finished: __________

JOB #6 MEASURING VOLTAGE DROPS

Estimated time: 5 minutes

1) Energize the circuit and measure:
a) Voltage drop across resistor 1 = __________
b) Voltage drop across resistor 2 = __________
c) Voltage drop across resistor 3 = __________
Time started: __________
Time finished: __________

JOB #7 MEASURING CURRENT

Estimated time: 10 minutes

1) Increase the total voltage to 15 volts and measure the new value of current:
a) Total current at 15 volts = __________
2) Decrease the total voltage to 5 volts and measure the new value of current:
a) Total current at 5 volts = __________
Time started: __________
Time finished: __________

JOB #8 VERIFICATION OF OHMS LAW

Estimated time: 5 minutes

1) Explain the difference between the two current readings obtained in JOB #7.

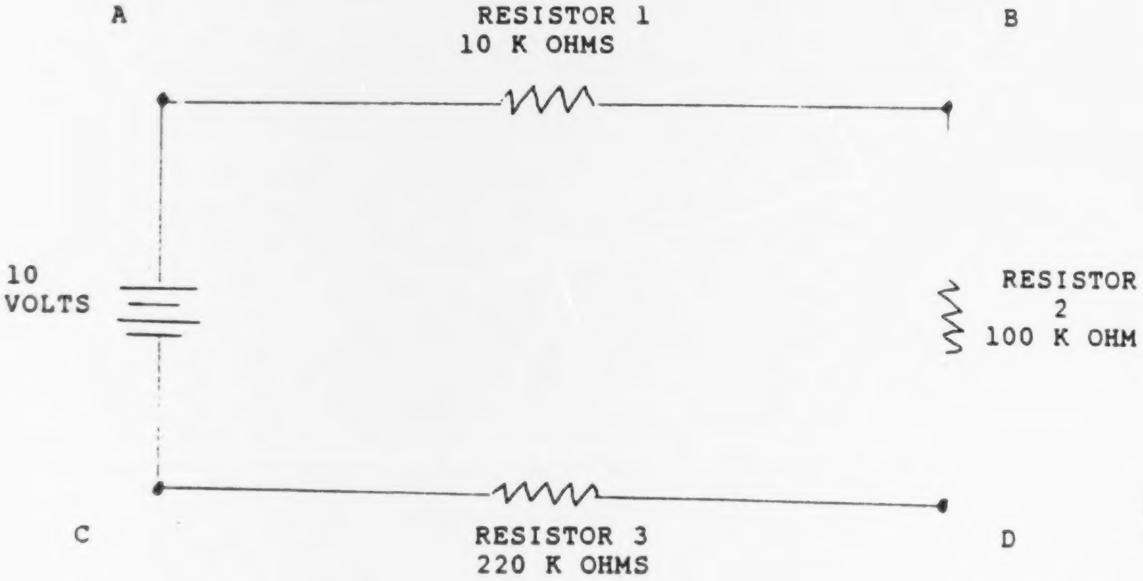
Time started:________
Time finished:________

JOB #9 CALCULATING POWER

Estimated time: 5 minutes

1) Calculate power using the measured values of voltage and current for the circuit:
a) Power across resistor 1 = __________
b) Power across resistor 2 = __________
c) Power across resistor 3 = __________
d) Total power
Time started: __________
Time finished: __________

FIGURE 1


A
RESISTOR 1
10 K OHMS
B
10
VOLTS
RESISTOR
2
100 K OHM
C
RESISTOR 3
220 K OHMS
D

STUDENT MANUAL

COMPETENCY EXAMINATION

FOR

COMPUTER SCIENCE

MICROCOMPUTING - RELATED OCCUPATIONS

COMPETENCY TO BE EXAMINED

PREPARING A SPREADSHEET DOCUMENT

DEVELOPED BY

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KILGORE JUNIOR COLLEGE

AND

MS. MARIBETH L. KING - INSTRUCTOR

KILGORE JUNIOR COLLEGE

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS TO THE STUDENT

Competency: Preparing a Spreadsheet Document.

Performance Objective: The student will demonstrate the ability to perform the commands using a spreadsheet software to create, format, modify, analyze and report information, achieving 100% mastery on the performance exam.

1) The maximum time allowed for the exam is one hour and thirty minutes.

2) The performance examination consist of six tasks.

3) For each task, you will be evaluated on your ability to perform the skills necessary for mastery of the competency.

4) This test booklet, reference material, student printed material and diskette must be returned to the examiner before leaving the area.

5) After you have read the exam instructions, inform the examiner that you are ready to begin the exam.

Material Needed:

Blank 3 1/2" diskette
Various spreadsheet software packages and manuals

Facility:

Computer Science Lab

Time started: _________
Time finished: _________

COMPETENCY EXAMINATION
ON
PREPARING A SPREADSHEET DOCUMENT

PERFORMANCE EXAM:

TASK 1 Create a worksheet with the following information.

INPUT INFORMATION NEEDED

SALESPERSON	BASE PAY	COMMISSION RATE	SALES
David Anderson	400.00	3%	4,500.00
Ray Bell	300.00	3%	1,445.80
Jeremy Pate	300.00	4%	1,320.94
Lynn Hubbard	500.00	5%	3,798.76
Jack Taylor	475.00	4%	1,079.86
Dan Smith	350.00	2%	1,826.25
Norman White	375.00	5%	3,894.39

Print a copy of the worksheet.

TASK 2 Use the arithmetic and functions to calculate the total amount of commissions and the total gross pay for each employee. The copy command should be used. Print a copy of the worksheet.

TASK 3 Now, calculate the total sales of all employees, the total number of salespeople and the total gross pay for all employees. Print a copy of the worksheet.

TASK 4 Modify the spreadsheet by:

1) Increasing the column width of the sales to 10 spaces.
2) Format all the numeric values so that no decimal values are included.
3) Change the base pay of Ray Bill to $350.00.
4) Print a copy of the worksheet.

TASK 5 Create a line graph showing differences in sales for all employees and print the graph.

TASK 6 Save the spreadsheet on your diskette and turn in the diskette with the printed material.

COMPETENCY EXAMINATION RATING SHEET
FOR
PREPARING A SPREADSHEET DOCUMENT

Performance Objective: The student will demonstrate the ability to perform the commands using a spreadsheet software to create, format, modify, analyze and report information, achieving 100% mastery on the performance exam.

STUDENT ______________________ Competency Mastered YES ____ NO ____

EXAMINER ______________________ Date of Rating ______________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE	
	Satis-factory	Unsat-isfactory
1. Load the spreadsheet program.		
2. Open a new spreadsheet file.		
3. Enter labels\values\and functions into the file.		
4. Format cells.		
5. Edit cell entries.		
6. Perform the copy function.		
7. Print graphs and reports.		
8. Save the spreadsheet file.		

Comments:

EXAMINER MANUAL

COMPETENCY EXAMINATION

FOR

COMPUTER SCIENCE

MICROCOMPUTING - RELATED OCCUPATIONS

COMPETENCY TO BE EXAMINED

PREPARING A SPREADSHEET DOCUMENT

DEVELOPED BY

DR. VANESSA EVANS HUSE - INSTRUCTOR

KILGORE JUNIOR COLLEGE

AND

MS. MARIBETH L. KING - INSTRUCTOR

KILGORE JUNIOR COLLEGE

FOR

PARIS JUNIOR COLLEGE

JUNE, 1993

SPECIFIC INSTRUCTIONS TO THE EXAMINER

Competency: Preparing a Spreadsheet Document

Performance Objective: The student will demonstrate the ability to perform the commands using a spreadsheet software to create, format, modify, analyze and report information, achieving 100% mastery on the performance exam.

1) The maximum time allowed for the exam is one hour and thirty minutes.
2) There are six tasks that the student must complete. The criteria for mastery is one hundred percent.
3) Clarify any questions before the exam begins.
4) Upon completion of the exam verify that all testing materials are in your possession.
5) Enter student performance on their individual competency rating sheet.

Materials Needed:

Blank 3 1/2" diskette
Various spreadsheet software packages and manuals

Facility:

Computer Science Lab

Time started:__________
Time finished:__________

COMPETENCY EXAMINATION
ON
PREPARING A SPREADSHEET DOCUMENT

PERFORMANCE EXAM:

TASK 1 Create a worksheet with the following information.

INPUT INFORMATION NEEDED

SALESPERSON	BASE PAY	COMMISSION RATE	SALES
David Anderson	400.00	3%	4,500.00
Ray Bell	300.00	3%	1,445.80
Jeremy Pate	300.00	4%	1,320.94
Lynn Hubbard	500.00	5%	3,798.76
Jack Taylor	475.00	4%	1,079.86
Dan Smith	350.00	2%	1,826.25
Norman White	375.00	5%	3,894.39

Print a copy of the worksheet.

TASK 2 Use the arithmetic and functions to calculate the total amount of commissions and the total gross pay for each employee. The copy command should be used. Print a copy of the worksheet.

TASK 3 Now, calculate the total sales of all employees, the total number of salespeople and the total gross pay for all employees. Print a copy of the worksheet.

TASK 4 Modify the spreadsheet by:

1) Increasing the column width of the sales to 10 spaces.
2) Format all the numeric values so that no decimal values are included.
3) Change the base pay of Ray Bill to $350.00.
4) Print a copy of the worksheet.

TASK 5 Create a line graph showing differences in sales for all employees and print the graph.

TASK 6 Save the spreadsheet on your diskette and turn in the diskette with the printed material.

STUDENT MANUAL

COMPETENCY EXAMINATION
FOR
COMPUTER SCIENCE
MICROCOMPUTING - RELATED OCCUPATIONS

COMPETENCY TO BE EXAMINED
PERFORM COMMANDS USING A DATABASE

DEVELOPED BY
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KILGORE JUNIOR COLLEGE

FOR
PARIS JUNIOR COLLEGE
JUNE, 1993

SPECIFIC INSTRUCTIONS FOR THE STUDENT

Competency: Perform Commands Using a Database.

Performance Objective: The student will demonstrate the ability to perform the commands using a database for creating, updating and reporting information, achieving 100% mastery on the performance exam.

1) The maximum time allowed for the exam is one hour and thirty minutes.

2) The perform exam consist of nine tasks.

3) You will be evaluated on your ability to perform the skills necessary for mastery of the competency.

4) This test booklet, reference material, student printed material and diskette must be returned to the examiner before leaving the area.

5) After you have read the exam instructions, inform the examiner that you are ready to begin the exam.

Materials Needed:

Blank 3 1/2" diskette
DBase Software package and the manuals

Facility:

Computer Science Lab

Time started __________
Time finished __________

COMPETENCY EXAMINATION
ON
PERFORMING COMMANDS USING A DATABASE

PERFORMANCE EXAM:

TASK 1 Design and input the following new database called employee.

DATA BASE PROJECTS

The structure should look like the following:

FIELD NAME	TYPE	WIDTH	DEC
NUMBER	N	4	0
LAST_NAME	C	9	
FIRST_NAME	C	8	
DEPARTMENT	C	10	
PAY_RATE	N	5	2
UNION	C	1	

TASK 2 Insert the following data in this data base:

NUMBER	NAME		DEPARTMENT	PAY RATE	UNION
1013	McCormack	Nigel	Shipping	8.25	Y
1016	Ackerman	David	Accounting	9.75	N
1017	Castle	Mark	Shipping	7.50	Y
1020	Edwards	Charles	Production	8.60	Y
1026	Evans	John	Marketing	6.00	N
1040	Anderson	Carol	Accounting	11.00	N

TASK 3 Print a list of the structure.

TASK 4 Modify the database structure by adding a new field which holds two social security numbers of each employee. Then add the information below for each person.

1013 -- 456-11-2222
1016 -- 456-22-1111
1017 -- 456-33-4444
1020 -- 456-44-3333
1026 -- 456-55-6666
1040 -- 456-66-5555

TASK 5 Add the following new employee to your records:

1050
Smith, John
Marketing
10.40
y
456-77-6666

Mark Castle is changing departments and will now be working in production. Update the database.

Carl Anderson has left the company and her name needs to be deleted.

TASK 6 Print a list of the structure.

TASK 7 Search the database and print all the employee's who make less than $8.00 per hour.

TASK 8 Sort the database and print a report that list all employees in alphabetical order. The fields to be printed are Last_Name, First_Name and Pay_Rate.

TASK 9 Save the database on your diskette and turn in the diskette with the printed material.

COMPETENCY EXAMINATION RATING SHEET
FOR
PERFORM COMMANDS USING A DATABASE

Performance Objective: The student will demonstrate the ability to perform the commands using a database for creating, updating and reporting information, achieving 100% mastery on the performance exam.

STUDENT ______________________ Competency Mastered YES ____ NO ____

EXAMINER ______________________ Date of Rating ______________________

PERFORMANCE CRITERIA	STUDENT PERFORMANCE	
	Satisfactory	Unsatisfactory
1. Load the DBase program.		
2. Open a new record file.		
3. Design and enter a database structure.		
4. Modify the database structure by editing fields.		
5. Add records.		
6. List records.		
7. View and print data in non-report format.		
8. Edit a record.		
9. Search for a record.		
10. Delete a record.		
11. Sort a file.		
12. Print a report.		
13. Save a database.		

Comments:

EXAMINER MANUAL

COMPETENCY EXAMINATION
FOR
COMPUTER SCIENCE
MICROCOMPUTING - RELATED OCCUPATIONS
COMPETENCY TO BE EXAMINED
PERFORM COMMANDS USING A DATABASE

DEVELOPED BY
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KILGORE JUNIOR COLLEGE
AND
MS. MARIBETH L. KING - INSTRUCTOR
KILGORE JUNIOR COLLEGE

FOR
PARIS JUNIOR COLLEGE
JUNE, 1993

SPECIFIC INSTRUCTIONS TO THE EXAMINER

Competency: Perform Commands Using a Database.

Performance Objective: The student will demonstrate the ability to perform the commands using a database for creating, updating and reporting information, achieving 100% mastery on the performance exam.

1) The maximum time allowed for the examination is one hour and thirty minutes.

2) The performance exam consists of nine tasks. The criteria for mastery is one-hundred percent.

3) The examiner is to be sure that each student has a copy of the exam booklet, a blank diskette and word processing software with manuals.

4) All rating should be made on individual student competency rating sheet.

5) Upon completion of the exam verify that all testing materials are in your possession.

Materials Needed:

Blank 3 1/2" diskette
DBase Software package and manuals

Facility:

Computer Science Lab

Time started:__________
Time finished:__________

COMPETENCY EXAMINATION
ON
PERFORMING COMMANDS USING A DATABASE

PERFORMANCE EXAM:

TASK 1 Design and input the following new database called employee.

DATA BASE PROJECTS

The structure should look like the following:

FIELD NAME	TYPE	WIDTH	DEC
NUMBER	N	4	0
LAST_NAME	C	9	
FIRST_NAME	C	8	
DEPARTMENT	C	10	
PAY_RATE	N	5	2
UNION	C	1	

TASK 2 Insert the following data in this data base:

NUMBER	NAME		DEPARTMENT	PAY RATE	UNION
1013	McCormack	Nigel	Shipping	8.25	Y
1016	Ackerman	David	Accounting	9.75	N
1017	Castle	Mark	Shipping	7.50	Y
1020	Edwards	Charles	Production	8.60	Y
1026	Evans	John	Marketing	6.00	N
1040	Anderson	Carol	Accounting	11.00	N

TASK 3 Print a list of the structure.

TASK 4 Modify the database structure by adding a new field which holds two social security numbers of each employee. Then add the information below for each person.

1013 -- 456-11-2222
1016 -- 456-22-1111
1017 -- 456-33-4444
1020 -- 456-44-3333
1026 -- 456-55-6666
1040 -- 456-66-5555

TASK 5 Add the following new employee to your records:

1050
Smith, John
Marketing
10.40
y
456-77-6666

Mark Castle is changing departments and will now be working in production. Update the database.

Carl Anderson has left the company and her name needs to be deleted.

TASK 6 Print a list of the structure.

TASK 7 Search the database and print all the employee's who make less than $8.00 per hour.

TASK 8 Sort the database and print a report that list all employees in alphabetical order. The fields to be printed are Last_Name, First_Name and Pay_Rate.

TASK 9 Save the database on your diskette and turn in the diskette with the printed material.

STAFF DEVELOPMENT PLAN

TEXAS SKILLS STANDARDS AND CERTIFICATION PROJECT

by

TEXAS INSTRUMENTS

and

The University of North Texas

with support from

THE ELECTRONICS INDUSTRY FOUNDATION

Prepared by:

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Dr. Jessie Teddlie

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PROFESSIONAL DEVELOPMENT PLAN

Introduction:

The underlying theme, if not a stated purpose, of all educational and training reform movements of the 1990's has been that of "*creating and maintaining a competitive workforce for a changing global economy.*" With the increased emphasis of a competitive workforce for the world economy, there should be an increased emphasis on the improvement of the staff of the educational/training community that is responsible for education/training of the workforce. The quality of occupational/career preparation programs is directly dependent on the quality of the staff and faculty who plan, develop, and deliver the instructional content of the occupation/career for which education/training is being provided.

Staff development through pre-service or in-service preparation or in-service improvement is necessary if stakeholders of the educational/training are to meet the responsibilities and changes of educational reform movements designed to prepare us for the 21st century.

Changes and improvements sought by educational reform movements must be implemented by an informed and internationally competitive staff of the educational community. Educational staff must be developed to the point that the creativity, energy, and leadership of each staff member can take place in relation to past accomplishments and therefore, **provide a greater assurance that positive change will endure after the reform effort has taken place.**

It is concluded that with all of the educational reform movements since the 1990's, very little emphasis has been placed on the importance, content, and delivery of instruction for the preparation and professional improvement of the educators who have the responsibility of carrying out the desired reform. The exception to this conclusion is the ***School-to-Work***

Opportunities Act of 1994. Extensive research has been conducted in relation to the reasons, objectives, and components of each reform movement, but little has been done in the field of teacher education. As used here, the term "teacher education" refers to the preparation and professional improvement of all staff (administrators, counselors, faculty) of the educational/training community.

It has been considered that research in teacher education is less prominent than other areas of study in education. Teacher education/training has been and may always be considered as an ancillary to the education and training of our society. It is surprising that policy makers in education will mandate "who" is to be served and the "what" they are to be served, but provide few, if any, mandates about the ability and quality of the servers.

Historically, teacher preparation programs have consisted of three basic components: subject matter education (content), general education, and professional development. From the review of the limited research on teacher education, it has been concluded that the curriculum content of the professional development component of teacher education has been based on perceptions of what educators should know and do. It is observed that programs, projects, and mandates designed to establish a world class workforce mandate that the curricula for preparing the workforce must be based on the requirements of the workplace. However, it is observed that teacher education preparing individuals for entry into the workforce as educators is based on perception. Similarly, the design and content of in-service education or professional improvement activities are based on the perception of the leaders or administrators of the reform movement at state and local agencies that distribute or allocate funds for the reform movement.

After reviewing the sections on "*Teachers in Vocational Education*" and "*Teaching Practices*" in the ***INTERIM REPORT TO CONGRESS OF THE NATIONAL ASSESSMENT OF***

VOCATIONAL EDUCATION (1994), it was concluded that there is a dire need for reform in teacher education, especially in teacher education of staff responsible for career or occupational education programs. The **INTERIM REPORT** states: "*one of the key inputs to education is the quality of the teaching force. Hence, the Perkins Act mandates an evaluation of the preparation and qualifications of vocational and academic teachers.*"

The importance of teacher education/training and/or professional improvement activities for staff of school-to-work activities and programs is referenced several times in the "*School-to-Work Opportunities Act of 1994*". The references include:

> *Section 205. Use of Amounts*
>
> "*(7) supporting local planning and development activities to provide guidance, training and technical assistance for teachers, employers, monitors, counselors, administrators and others in the development for School-To-Work Opportunities programs;*
>
> *(8) identifying or establishing mechanisms for providing training and technical assistance to enhance the development of the statewide School-To-Work Opportunities system;*
>
> *(9) developing a training and technical support system for teachers, employers, mentors, counselors, related services personnel, and others that include specialized training and technical support for the counseling and training of women, minorities, and individuals with disabilities for high-skill, high-wage careers in non-traditional employment;*"
>
> *Section 213. Application*
>
> "*(d) State Plan . . .*
> *(7) describe the strategy of the State for providing training for teachers, employers, mentors, counselors, related services personnel, and others including specialized training and technical support for counseling and training of women . . ., and provide assurances of coordination with similar training and technical support under other provisions of law;*"

The provisions and mandates for teacher education (staff development) by the *School-To-Work Opportunities Act of 1994*, if adhered to, will initiate a **"second wave"** of education reform focused on teacher education. This **"second wave"** of reform will require a

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Professional Development Plan that departs from the traditional four year teacher education (staff development) program in both curriculum development (instructional content of pre-service and in-service programs) and the organizational structure used for the delivery of that instructional content.

The statement made by Secretary of Labor, Robert Reich, at the President's signing of the ***School-To-Work Opportunities Act of 1994*** could very well apply to the teacher education programs. Secretary Reich's statement that could apply was: "*Again, the four-year college degree has become a proxy for employers too often signaling that here is person who is worth investing in for lifelong learning.*"

A study, funded by the Texas Higher Education Coordinating Board and conducted by the University of North Texas, to determine the capacity of Texas teacher education institutions to meet the assessed professional development needs of postsecondary technical educators revealed that the programs of the majority of responding institutions were not capable of preparing or professionally improving staff to perform new responsibilities for Perkins II and Tech Prep. It was concluded in the report of the study that the career and technology (vocational) teacher education programs being studied did not have the capacity to meet the professional improvement needs of postsecondary technical/vocational personnel **because the teacher education programs were not competency-based.** Acceptance of this conclusion would mean that the vocational teacher education programs reviewed by the study were **not in compliance** with **Section 13.032** (e) of **THE EDUCATION CODE** as amended by **House Bill 72.** Section 13.032 (e) as amended, requires an examination of subject mastery and teaching skills. The requirement for **competency-based** teacher education programs is implied by House Bill 72 which states: "*The examinations prescribed* *in Section 13.032 (e) and Section 13.047 of The Education Code are the only examinations allowed to be utilized for the purpose of testing teacher and administrator competency."*

If we are to achieve teacher education reform via the use of non-traditional structures or systems for the delivery of instructional content, then it becomes apparent that what may be considered as alternative or non-traditional teacher education or staff development must be used to prepare or retrain staff to implement non-traditional systems. It has been determined by a study conducted by the National Center for Research in Vocational Education (1988) that: *"alternative programs that meet the American Association of College of Teacher Education (AACTE) requirements are recognized as unique in their approach to preparing non-traditional teachers. However, they are identical to traditional programs in that they contain the same set of standards for certification."*

Legislation passed by Congress and the State legislature during the past two years to achieve a competitive workforce implies and mandates the collaboration of all federal, state and local entities who are stakeholders in the preparation of the competitive workforce. Therefore, staff development must have a mutual involvement of all staff engaged in the education/training of the workforce.

Staff development, whether pre-service or in-service, **must be directly related to the job description of each staff member of the education/training component or effort.** Legislation that provides for new services, strategies, or programs for the reform of education and training of the workforce **either creates new positions, adds new responsibilities to existing positions,** or both and requires staff development activities. Staff development is essential to the success of education and training reforms and must be conducted for staff of all stakeholders at the state, regional and local levels.

Goal III of the MASTER PLAN FOR CAREER AND TECHNICAL EDUCATION emphasizes this importance of staff development with the statement:

> *"meet the professional development needs of Texas faculty and staff to ensure successful student and adult learner outcomes for all public and training institutions."*

A review of the strategies and performance indicators of secondary education and higher education for **Goal III of the MASTER PLAN** did not reveal that proposed strategies would be based on assessed professional development needs in relation to job descriptions (requirements of the workplace) of the faculty and staff to be served by **Goal III.**

This summer (1994), the **National Youth Employment Coalition** in a draft of its report, ***"Findings: How We Can Better Serve At-Risk Youth"***, emphasized the need for staff development for building the capacity of youth-service providers, front line staff and administrators as being critical for effectively serving at-risk youth.

The **Texas Business and Education Coalition** in the document, ***"Restructuring Texas Education: A Framework for Change"***, strongly supports staff development in its "*Ten Requirements of Change*" which included: "*4. Attract and Develop Effective Educators*" and "*5. Improve Curricula and Teaching Techniques.*"

To achieve ***"Requirement 4"***, the Coalition stated: "*Serious concern is raised about the relevance of existing professional education of teachers and administrators. Teacher education must be restructured to remove out-of-date methods and practices that do not support the needs of today's students.*"

It becomes evident that staff development, which everyone agrees is vital for effective instruction, is always the smallest item on the budget. Yet, the teaching staff is the most important resource of any education and training entity.

It is very obvious that the greatest barrier that we have in training, retraining, and educating a competitive workforce is the lack of properly prepared education and training personnel. This barrier has been created and perpetuated by: (1) fragmentation or turfdoms of teacher education (staff development) programs and services; (2) fragmentation and turfdom of providers of occupation (career) preparation programs and related services; (3) leadership being overworked, underpaid, and not having been provided pre-service or in-service staff development for the position to which assigned; and (4) the qualifications (educational preparation and experience) of personnel who are selected to provide pre-service and in-service staff development.

Fragmentation and turfdom that exists in staff development which must be overcome includes the use of education and training jargon used by different providers of occupational preparation and related services. An example of the perpetuation of the fragmentation of staff development which appears in the current **MASTER PLAN for CAREER AND TECHNICAL EDUCATION** is the statement: "*Provide Tech-Prep staff development and certification for all personnel.*" Do students in "Tech Prep" learn differently than do students in other occupational (career) preparation programs or courses?

All education and training legislation passed by Congress during the past two years include, to various degrees, programs and/or activities that contribute to the development of a quality workforce. An in-depth review of the major legislative acts revealed mandates for collaborative planning and implementation of each act by respective state agencies with other state agencies responsible for programs and services with related or common (targeted) populations and purposes. Also, in the draft of "***A Report to the 73rd Legislature by the Design of Apprenticeship and Career Pathways Programs for Youth***", it was recommended that: "*Texas should develop a strategic plan for the delivery of training for all educators,* *counselors, employers and workplace mentors on how to develop and deliver competency-based instruction in the school-to-work system."*

With only the limited background information presented in this document, there is evidence that in the state of Texas that **there is an immediate need for the development and implementation of a statewide comprehensive staff development program for the staff of all stakeholders involved in the training and retraining of a competitive workforce.**

The staff development program should be designed to include the following:

- **Based on the assessed professional improvement needs of existing staff members and the assessed professional preparation of new staff;**
- **To meet the needs of staff of all state agencies and local entities approving and/or (1) designing curriculum; (2) delivering instruction of the curricula; and (3) providing career guidance and support services to individuals preparing to enter, pursuing, and completing occupational preparation programs/courses;**
- **To upgrade and/or prepare "trainers of trainers";**
- **To provide staff development at the time and place convenient to the targeted staff; and**
- **That is competency-based and performance measured.**

Financial resources are currently available at the state level to design, implement, evaluate, and maintain a comprehensive statewide program of staff development for all individuals having governance and/or the responsibility of providing public occupational (career) preparation and retraining programs and selected services in Texas.

Plan:

The purpose of the Skill Standards and Certification Projects sponsored by the Texas Tri-Agency Partnership as stated in the RFP: ". . . *is to improve the strategies for delivery of*

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education, training, and support services so that students are equipped with technical and SCANS skills needed for successful employment in the modern workplace." In order to achieve this stated purpose and for the products of the project to have the greatest impact, it will be necessary that a comprehensive professional development plan be developed and implemented on a state-wide basis. The professional development plan must provide for the development of the skills and knowledge needed by **all educators** to achieve the above stated purpose of the Skill Standards and Certification Projects.

The professional development plan to develop and achieve the previously stated purpose must be **holistic** in nature, meet the needs of all stakeholders, and be delivered in a manner that eliminates barriers that prevent access to all who need and desire to participate in professional improvement activities.

The professional development proposed by this project is based on the premise that: (1) **professional development consists of professional preparation and professional improvement; (2) instructional content for professional preparation curricula should be based on skill standards derived from the workplace; (3) professional improvement should provide for meeting the individual needs for improvement based on the new educational technologies, educational initiatives, new education legislation, additional preparation needs of individuals who move horizontally or vertically in the field of education; (4) professional preparation may be provided using a pre-service or in-service structure; and (5) professional improvement may include (1) the acquisition of new knowledge and (2) the development of new skills and related knowledge required to develop and perform additional responsibilities and functions required by new educational initiatives.**

The professional development plan for meeting the purpose of the Skill Standards and Certification Projects is long range in nature. The components and procedures for implementing the plan are described in the following narrative.

A. Identification of personnel who will be involved in programs/activities essential to achieve the goal or purpose of the initiative.
    (1) Identify the classification of personnel who must be involved;
    (2) Establish the role of each classification of personnel involved;
    (3) Determine if the professional development will be preparation, improvement, or both based on the classification of personnel involved with the initiative.

B. Determine if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge.

C. Identify what knowledge and skills are prerequisite to the objective or purpose of the staff development activity being planned.

D. Analyze the skill(s) to be taught to identify and sequence instructional content.

E. Estimate time required for delivery of instruction.

F. Develop assessment instruments to determine if training participants developed/attained skills and knowledge that were taught.

G. Estimate time required for assessments.

H. Develop basic course outline for instruction (working agenda for a one or two day workshop/conference).

I. Select time(s) and place(s) for delivery of instruction.

J. Select and train instructors to deliver instructions.

K. Publicize staff development activity and obtain registration of participants.

L. Evaluate instruction (staff development activity):
    (1) on-site;
    (2) follow-up.

It is recommended that any professional development programs, workshops, or activities that are conducted to make potential users of the project products aware of the product and how they could be used should observe the components of the above plan.

An analysis of the skills needed most by faculty, instructors, and other professional staff to deliver enhanced curriculum that infuses SCANS skills revealed a variety of prerequisite skills and knowledge (skill standards for educators). The prerequisite skills included the knowledge and skills required by the project staff and consultants to complete this project. The prerequisite skills/knowledge required for infusing SCANS into the Curriculum included:

- Developing a competency-based curriculum;
- Developing definitive (basic) course outlines;
- Developing instructional content and related instructional materials;
- Writing instructional and student outcome objectives in performance terms;
- Developing and administering criterion-referenced cognitive and performance tests; and
- Understanding of the purpose and findings of the research that identified the SCANS skills.

The limitation of the time and budget did not provide an opportunity for an assessment (item C of the plan) of individuals to be provided with staff development to determine to what extent they were ready by experience and training to benefit from the staff development objective of the project. Any staff development program or activity planned and conducted without identifying the prerequisite skills of the proposed participants should be done primarily for the purpose of awareness.

The staff development (improvement) program/activity proposed by this project was designed for the purpose of awareness. Following is an agenda of a one-day workshop developed to make individuals aware of: (1) SCANS research; (2) the value of infusing the SCANS skills into the occupational preparation curricula; and (3) examples of the process used for the infusion of the SCANS skills. This one-day training will be provided through a Texas Higher Education Coordinating Board funded project, but the next phase of staff

SAMPLE AGENDA

Implementing Workplace Competencies
Based on SCANS Research

8:30 a.m.	Introduction and Overview
9:00 a.m.	Trends and Issues for Competency-Based Education • Mandates of the Coordinating Board • Mandates for Institutions Using Perkins Funds • Goals and Objectives of the State Plan and Master Plan • Relationship of Competency-Based Education to Evaluation and Monitoring
10:00 a.m.	Discussions by Workshop Participants on 9:00 a.m. Presentation
10:30 a.m.	Break
10:45 a.m.	Overview of SCANS Research Workplace Competencies
11:45 a.m.	Lunch
1:00 p.m.	Procedures for Implementing Workplace Competencies in the Technical Curricula • Review of Terms (i.e. Curriculum, Program, Courses of Study, Course syllabus, Course Outlines, Competencies, Tasks, Performance Measures, Criterion Referenced) • Identifying Discrepancies of SCANS Competencies in the Curriculum
2:45 p.m.	Break
3:00 p.m.	Participant Activities to Demonstrate Attainment of Content Presented. (Participants divided into groups for this activity.)
4:00 p.m.	Groups present results of Demonstration
4:30 p.m.	Evaluation of Day 1 Activities, Questions-Answers
5:00 p.m.	Close

development/training which must go beyond awareness has not been addressed by any funding source as yet. It is the opinion of the project staff of this project that the next phase of staff development/training be done by following the stated procedures on page 13 - A. - L.

A training and development Task Force consisting of the staff from each of the four sites as each have unique aspects which need to be addressed. The project could utilize the University of North Texas as the fiscal agent because of the incentives to participate which could include college credit offered in a non-traditional format for the four-day workshop or conference if an "work-site" project was completed by the participants. The project could be "enhancing the curriculum" for one of their existing programs or developing (as did one of the project sites) a new curriculum for a new training program. For those not wishing to register for full college credit, continuing education credits and LPC could be an option. Each site would be assigned responsibilities and receive funds to complete the responsibilities prior to/during the training workshops/conferences. Each site would designate a trainer and assist in the development of the specific objectives based on the needs assessment whether it be prerequisite training or new skill knowledge training. This would include completing A - H above and J. The project staff at the University of North Texas would complete, based on recommendations of the Task Force, I, J, K, and L as outlined below:

GOAL AND OBJECTIVES

The goal and objectives of this project would be:

Goal: Develop a plan for providing professional development and training for teachers, counselors, workplace trainers and monitors, administrators and supervisors which incorporates the findings and materials of the four Skill Standards and Certifications Projects.

Objectives:

A. Analyze all four projects and the reports from the Third Party Evaluators to determine the commonalities and differences of the projects and materials.

B. Conduct a needs assessment to determine: (1) if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge; (2) to identify what prerequisite knowledge and skills as identified need to be provided or that the possible participants have; (3) if the professional development will be preparation, improvement or both based on the needs of the possible participants.

C. Analyze the skill(s) to be taught to identify and sequence instructional content.

D. Develop assessment instruments to determine if training participants developed/attained skills and knowledge that were taught.

E. Publicize staff development activity and obtain registration of participants.

F. Provide the staff development in workshops/conference format based on Task Force recommendations.

G. Evaluate staff development activity on-site and as follow-up.

H. Prepare and submit all reports.

SCOPE OF WORK

The scope of work to be achieved by this staff development plan is to: "**Develop a plan providing professional development on a large scale throughout the state for secondary and postsecondary teachers, counselors, administrators, and workplace trainers and mentors which incorporates the findings and materials of the four Skill Standards and Certification Projects.**" The purpose of the project, scope of work, project objectives, and evaluation criteria specified by the projects' staff will serve as guides for the procedures to be employed in achieving the goal of this proposed project.

The procedure plan for achieving the scope of work specified includes:

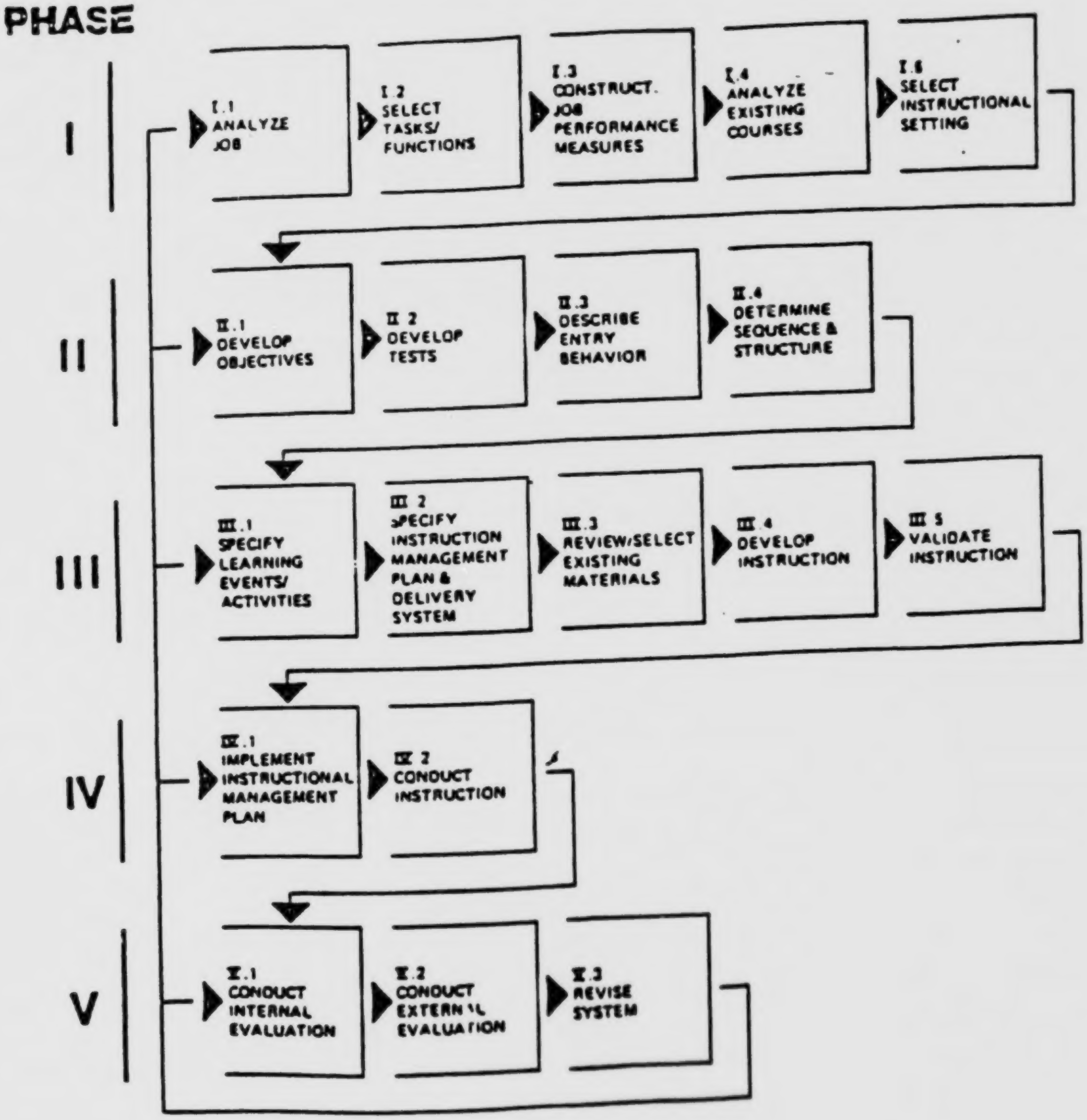
1. a listing of tasks by objectives with a narrative description of activities executed to perform the tasks;
2. a management plan with a time schedule showing the beginning and ending dates of each task and measurement indicators of the completion of each activity and task performed;
3. external communication and coordination; and
4. evaluation plan.

This procedure plan for carrying out this project will observe the procedures of the Instructional Systems Development (ISD) used by the U.S. Air Force curriculum development specialists. The ISD is more specific, more inclusive, and more appropriate for emerging occupations than is the Development of a Curriculum (DACUM) system. A graphic description of the ISD is shown in Display 1. Phase I of the ISD model provides for conducting analytical studies which provide input and output for the subsystems of the phases.

The achievement of the project objective A will observe the steps of Phases I, II, and III of the ISD. Phase IV of the ISD will serve as a guide in the achievement of objective C, "*recommend a strategy and methods for delivering professional development /training based on the Skill Standards and Certification Projects.*" Objective C will also be achieved in accordance with I.5 of Phase I, III.2 of Phase III and all of Phase V of the ISD model. Each of the proposed project objectives have been analyzed to identify the tasks that are to be performed to achieve each of the objectives. A task analysis was conducted to determine procedural activities for each of the tasks.

DISPLAY 1.

Instructional System Development


PHASE
I
I.1 ANALYZE JOB
I.2 SELECT TASKS/ FUNCTIONS
I.3 CONSTRUCT JOB PERFORMANCE MEASURES
I.4 ANALYZE EXISTING COURSES
I.5 SELECT INSTRUCTIONAL SETTING
II
II.1 DEVELOP OBJECTIVES
II.2 DEVELOP TESTS
II.3 DESCRIBE ENTRY BEHAVIOR
II.4 DETERMINE SEQUENCE & STRUCTURE
III
III.1 SPECIFY LEARNING EVENTS/ ACTIVITIES
III.2 SPECIFY INSTRUCTION MANAGEMENT PLAN & DELIVERY SYSTEM
III.3 REVIEW/SELECT EXISTING MATERIALS
III.4 DEVELOP INSTRUCTION
III.5 VALIDATE INSTRUCTION
IV
IV.1 IMPLEMENT INSTRUCTIONAL MANAGEMENT PLAN
IV.2 CONDUCT INSTRUCTION
V
V.1 CONDUCT INTERNAL EVALUATION
V.2 CONDUCT EXTERNAL EVALUATION
V.3 REVISE SYSTEM

Phase I: Analyze
Phase II: Design
Phase III: Develop
Phase IV: Implement
Phase V: Control

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TASKS

Objective	Task	Performance Measure	Dates of Completion
A. Analyze all four projects and the reports of the Third Party evaluators to determine the common-alities and differences of the projects and materials and how to provide intensive training/ staff development based on the findings.	1.Analyze all four projects and the reports of the third party evaluators to determine commonalities and differences of the projects and materials.	1. Commonalities/differences identified.	Jan 1995
	2.Identify personnel and determine: (1) the classification of personnel who must be involved; (2) establish the role of each classification of personnel involved; (3) develop needs assessment document to deter-mine if the professional develop-ment will be preparation, improvement, or both.	2a. Focus Group meeting held, roles identified, needs assessment document developed.	Feb 1995
B. Conduct a needs assessment to determine: 1) if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge; (2) to identify what prerequisite knowledge and skills as identi-fied need to be provided or that the possible participants have; (3) if the professional development will be preparation, improvement or both based on the needs of the possible participants.	3.Conduct needs assessment.	3a. Needs assessment mailed.	Mar 1995
		3b. Needs assessment completed.	Apr 1995
	4.Analyze needs assessment data to determine: (1) if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge;(2) to identify what prerequisite knowledge and skills as identified need to be provided or that the possible participants have; (3) if the professional development will be preparation, improvement or both based on the needs.	4a. Analysis of needs assessment data completed.	May 1995
C. Analyze the skill(s) to be taught to identify and sequence instructional content.	5.Analyze the skill(s) to be taught to identify and sequence instructional content.	5a. Skills to be taught identified.	Jun 1995
		5b. Instructional content developed and sequenced.	Jul 1995
D. Develop assessment instruments to determine if training participants developed/attained skills and knowledge that were taught.	6.Develop assessment instruments.	6a. Assessment documents developed.	Jul 1995
E. Publicize staff development activity and obtain registration of participants.	7.Publicize the staff development in workshops/conference format based on the Task Force recommendations by developing a flier and using computer communications networks.	7a. Flier developed.	Jul 1995
		7b. Flier mailed.	Aug 1995
		7c. Computer announcements completed.	Aug 1995
F. Provide the staff development in workshops/ conference format based on Task Force recommendations.	8.Provide staff development and training in 8 regional areas of the state in four-day workshops/ conference format.	8a. Eight workshops completed.	Nov 1995
G. Evaluate staff development activity on-site and as follow-up.	9.Evaluate staff development on-site and as follow-up.	9a. On-site evaluation completed.	Nov 1995
		9b. Follow-up evaluation completed.	Dec 1995
H. Prepare and submit all reports.	10.Prepare and submit reports.	10. Reports prepared and submitted.	
		1st quarterly	Mar 1995
		2nd quarterly	Jul 1995
		3rd quarterly	Nov 1995
		4th and Final	Dec 1995

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Task Procedures

Task 1. Analyze all four projects and the reports of the Third Party Evaluators to determine the commonalities and differences of the projects and materials and how to provide intensive training/staff development based on the findings.

The procedures, processes, and materials used/developed by each of the four projects must be evaluated to determine the commonalities and differences in each and how those components can or should be explored within the content of the staff development instructional content.

Task 2. Identify personnel and determine: (1) the classification of personnel who must be involved; (2) establish the role of each classification of personnel involved; (3) develop needs assessment document(s) to determine if the professional development will be preparation, improvement, or both.

Based on the results of Task 1, personnel involved in the Task Force from the four project sites will determine the role of each in this staff development project based on analysis information. They will also develop a needs assessment document(s) to be mailed to public schools and community/technical college appropriate personnel.

Task 3. Conduct a Statewide Assessment of the Professional Improvement Needs of Personnel Involved

A primary purpose of this task is the establishment of a system that will serve as a model for subsequent statewide assessments and for use by individual institutions to assess professional improvement needs unique to the local institutions and their personnel. Task 3 of this project is of such magnitude that it could stand alone as a full-year single research project.

A review of the literature will be conducted to determine by function the knowledge used and task/competencies performed by the following personnel in effectively carrying out their assigned roles and responsibilities for the competency-based education system:

1) Teachers;

2) Counselors;

3) Administrators;

4) Employers;

5) Workplace trainers; and

6) Mentors.

A list of task/competency statements will be developed for each of the personnel classified above. The list of task/competency statements will be validated by task force by using focus groups created and convened for each type of personnel to be provided professional improvement. The focus groups will consist of a minimum of five person per focus groups. The focus groups will assist in the validation by (1) verifying the list of task/competency statements and (2) assisting in the final validation by conducting a survey of incumbent workers in each of the classifications of vocational/technical personnel to be assessed during Phase I. An example of the survey form for validating the task/competency statements is presented in Appendix A. The four validated lists resulting from the surveys (one each for administrators, counselors, instructors, and workplace training and monitors) will be rewritten as knowledge/competency statements for the survey conducted to identify professional improvement needs.

A professional needs assessment survey system has been selected for this project. The system has been proven reliable through its use by a variety of state and national needs assessment projects. An example of the format for the survey form is presented in Appendix B. A computer program, previously tested for reliability, will show per knowledge/competency statement a need index. A survey questionnaire using the format referenced above will be mailed to the institutional coordinators/directors for faculty development at each of the Texas public community/junior colleges and technical institutes, high school campus principals, and personnel directors of business and industry. They will distribute and collect the questionnaires from the personnel being surveyed.

The data collected by the use of the use of the questionnaires will be keyed into the computer for storage and processing. The simple size of the populations to be surveyed will be determined by the project advisory committee. It is anticipated that sample sizes by population will be stratified. A need for professional improvement for each of the knowledge/competency statements will be obtained by determining the difference between the respondent's perceptions of their present level of performance for each knowledge/competency, their assignment, for work-based learning and their desired level of performance. This process is shown below.

Steps in Calculating a Need Index

Desired Mean - Present Performance Mean = Need Index

An adjusted need index for each knowledge/competency statement will then be compiled by multiplying the need index times the desired mean times a weight of 5. By using a weight of 5, the researcher can raise the maximum adjusted need index to a possible + or -100. This process is graphically described on the next page.

Steps in Calculating an Adjusted Need Index

Need Index X Desired Level Mean X Weight of 5 = Adjusted Need Index

The format of a printout resulting from the computer analysis is shown below.

Example of Computer Analysis Printout

```
                              Adjusted
                         1      2      3      4      5   Need    Need
                         +. . . + . . . + . . . + . . . +  Index   Index       N

Competency/Knowledge
Statement 1                     A............D             2.0     8.0        2,000

Competency/Knowledge
Statement 2                     A.............D            2.0     8.4          700

Competency/Knowledge
Statement 3              A....................D            3.0    15.0          100

Competency/Knowledge
Statement 4                            A.....D             1.0     3.9        1,100
```

A is the respondents actual (present) performance ability

D is the respondents desired performance ability

N is the Sample size

In addition to the priority (rank) listing based on an adjusted need index, a priority listing will be produced based on the desired level of performance as a constant. Thus, the priority ranking will be based solely on the respondents present performance ability assuming that all of the competency/knowledge statements are equally important. Therefore, if a respondent indicated on one statement that his/her present performance ability was two, then rated a second statement as five the second statement would be identified as a higher priority. A interim summary report of the covered professional development and training needs will be prepared using the data from the computer print-out and the review of the literature. The interim summary report will be submitted to the funding agency on as per specifications.

Task 4. Analyze needs assessment data to determine: (1) if the objective of the professional improvement requires new knowledge only or if it requires the development of new skills and knowledge; (2) to identify what prerequisite knowledge and skills as identified need to be provided or that the possible participants have; (3) if the professional development will be preparation, improvement or both based on the needs.

The identification of appropriate strategies and methods for delivering the professional development/training will be done by an analysis of the findings in Tasks 1 and 2. Based on the review of literature conducted for preparing this proposal there are a variety of strategies and methods for the delivery of professional development and training. the strategies/methods usually have been used in relation to the purpose of instruction. The three primary purposed identified for educators are: 1) preparation or preservice for certification or assignment, 2) inservice for certification or assignment, and 3) inservice for professional improvement in relation to the use of new technology, or new legislation for new services, program, and/or populations to be served.

Some strategies/methods are common across the three purposes of professional development and training. For example, workshops can be used in the achievement of three purposes of professional development and training. Seminars and conferences work well in professional development when the objective of instruction is to make the targeted audience knowledgeable of new legislation. Unfortunately, and for too often information about new programs or services mandated or offered by congress or the legislatures are not timely included in college preservice degree programs.

In addition to the findings from the review of the literature, the professional development assessment conducted will identify strategies and methods preferred by the respondents. the following should be included in analyzing strategies and methods: regional workshops, college credit courses, telecourses (college credit), individualized study, statewide workshops, regional and statewide conferences, and teleconferences.

Strategies and methods appropriate for recommendation for the professional improvement/training of systems will be listed by purpose with a brief description of the strategy/methods and the rational for its use, cost estimation and funding sources. A draft of the list of strategies and methods will be submitted to the Task Force for review and recommendations for approval. The list of recommendations strategies/methods will be revised using the recommendations of the Task Force and prepared for inclusion as a chapter of the Professional Development Plan.

Task 5. Analyze the skill(s) to be taught to identify and sequence instructional content.

The project staff and the Task Force will analyze the skill(s) to be taught to identify and sequence instructional materials including those developed by the four sites and any new, related information/materials needed based on the assessment of needs and the recommendations of the Task Force and funding agency.

Task 6. Develop assessment instrument(s).

The project staff and the Task Force will develop assessment instrument(s) to be used on-site as the training is provided as well as a follow-up instrument for impact of the training and further needs of the participants.

Task 7. Publicize the staff development in workshops/conference format based on the Task Force recommendations by developing a flier and using computer communications networks.

The project and workshops will be publicized by the use of a project flier. The flier will address the targeted audiences by describing the processes and objectives of the project. Additionally, the flier will alert faculty and staff of postsecondary institutions and teacher education institutions about the project and proposed workshops. The flier will be designed for mailing without an envelope. As a minimum, it will be one colored page, 8-1/2" X 11", printed on both sides, with a tear sheet, and contain information which will describe the project and products to include but not be limited to the following:

1) Project title (the project title will be placed two inches from the top of the center column);
2) Funding Staff Advisor and address;
3) Project staff and address and telephone number;
4) Federal funding source;
5) Purpose of project;
6) Objectives of project;
7) Brief description of the procedures to be utilized to achieve the objectives; and
8) Procedures for requesting additional information about the project workshops and workshop sites and dates.

Task 5. Conduct and evaluate a minimum of eight regional workshops/conferences

The ideal procedure would be to conduct a workshop in each of the eight Higher Education Regions. Therefore, eight workshops (4 days each) will be conducted to serve the potential participants of the eight higher education regions.

The workshops will be organized, conducted, and evaluated by observing a workshop plan which includes:

1) Selection of workshop site;
2) Identification of potential workshop of participants;
3) Invitations extended to potential participants;
4) Assignment of workshop presenters;
5) Finalization of agenda;
6) Preparation of workshop materials and procedures;
7) Conducting the workshop; and
8) Evaluation of the workshop.

The workshop sites will be as centrally located as possible to all of the potential participants in each of the eight Higher Education Regions and easily accessible by air transportation.

Before final selection of the site is made, hotels and/or postsecondary institutions will be contacted by telephone in order to obtain availability of lodging, if needed, and meeting rooms on the proposed dates of the workshop. During the same phone call, negotiations will be made for other accommodations for the participants. The proposed site and facility will be discussed with the funding Staff Advisor before firm decisions are made. When final selection of the site and facility is made, contractual agreements with each facility will be made to assure specified rates, meeting rooms, and other services to be provided for the project and participants. Assurances will be obtained from the selected hotel that all facilities are in compliance with Article 37 Accessibility of Meetings, Conferences, and Seminars To Persons With Disabilities. To assist in the assurances, the letters of notification to the selected participants will request that participants respond to the letter with the identification of facility requirements to meet their specific disabilities. A copy of Article 37 will be mailed to each facility with which negotiations are being conducted.

A basic agenda for four-day workshops will be prepared and sent to the Staff Advisor for approval or recommendations for approval. The agenda will be finalized and prepared for inclusion with the letters of invitations to the proposed participants.

Registration packets will be prepared by the project staff. Included as part of the registration packets will be name tags, final agenda, floor plan (if needed), and pencils. In addition, materials to be used by the participants to provide written reaction to instructional materials will be included as well as such items as forms for evaluating and making recommendations for improvement of future workshops.

A registration table will be maintained for one hour on each day at each of the workshop sites. Registration packets will also be distributed during the registration process. Prior to the workshop, each staff member will be assigned specific responsibilities for conducting the workshop. Staff responsibilities will include:

1) Setting up and holding registration;
2) Checking meeting room arrangements, water, handouts, and equipment needed for presentations;
3) Handling messages for staff, presenters, and participants;
4) Handling emergencies that may occur; and
5) Wrapping up the workshop - reports, evaluation, extra materials, and equipment disposition.

Task 9. Evaluate staff development on-site and as follow-up.

Evaluations of the workshop session will be made using a evaluation format agreed upon and developed by the Task Force. A sample format as shown in the sample in Appendix D has been used successfully before and will be recommended. Also, a follow-up evaluation will be completed to note impact and to identify further training needs. Results of the evaluations will be used in the preparation of the summary evaluation report and the Final Report.

Task 10. Prepare and submit reports.

In addition to the final project report and other reports required by the funding agency, interim reports and interim deliverables related to project products will be submitted by the principal investigator (project director) to the project advisor and/or third party evaluator.

Strategies and Methods

The RFP did not define how the words "strategies" and "methods" were to be used in the project. Since the RFP used the words "strategies and methods" it is concluded that the words as used in the RFP were not meant to be synonymous. Therefore, the words will be used in this section of the Plan as follows:

> "Strategy" is to mean procedural activities related to organizational structures, institutions or organizations who will deliver the training, obtaining and allocating resources for conducting training, preservice or inservice training, minimum training requirements in terms of clock hours, qualifications of trainers, training of trainers, arrangements for training such as contracts, certification requirements if needed, most appropriate times of the year for training in relation to the personnel being trained.
>
> "Method" will be used to mean how the professional development and training will be done such as workshops, conferences, seminars, college courses, individualized study, teleconferences and other distance learning methods, work-site learning, or combinations of the above.

Cost estimations for each strategy and method recommended in this section will be made. The recommended strategies and methods with cost estimations for each will be presented using both narrative and graphic descriptions. A rationale will be provided for each strategy and method recommended.

Potential Funding Options

This section will be developed using the results of the literature reviews conducted and other data collected. It is anticipated that the review of the literature will reveal that funds, other than those provided by the project source, could be found in the School-to-work Opportunities Act and from other congressional Acts such as Perkins, JTPA, Goals 200 Education Act, Elementary and Secondary Education Act, and the Higher Education Act may be available and legitimately used to implement the Plan in total or in parts in relation to instructional objective or the types and educational level (elementary, secondary, postsecondary) of the personnel to be trained. The availability of funds from the private sector will also be considered.

APPENDICES

APPENDIX A

APPENDIX A

PROPOSED FORMAT FOR JOB INVENTORY SURVEY

FOR VALIDATION TASK/COMPETENCIES OF INCUMBENT PERSONNEL

READ THIS PAGE BEFORE GOING FURTHER

Have you completed the Background Information Section? Make sure, before you continue with this procedure.

PROCEDURE A. CHECKING TASKS OF PRESENT TEACHING ASSIGNMENT

1. As you read each task in the Task section, pages 1 through 9, place check beside each task that you perform in your present assignment. Put your checkmark in the column headed "Check-If Done Now." When you have reached page 9, return to page 1.
2. DO NOT COMPLETE THE RIGHT-HAND COLUMN AT THIS TIME.
3. If a task that you perform is not listed anywhere in the entire list, write it on the blank page at the end of the booklet.
4. Do not confuse work you do yourself with work you supervise.
5. Remember, at this time you are to complete only the column headed "Check-If Done Now" for pages 1 through 9. Now, turn to page 1 and BEGIN.

PROCEDURE B. RATING TIME SPENT ON TASKS ON PRESENT ASSIGNMENT

1. Have you checked each task that you perform in your present assignment? Make sure, before you continue with this procedure.
2. Now you are to rate the relative amount of time you spend performing each task in your present assignment. Relative time spent means the total time you spend doing the task compared with the time you spend on each of the other tasks of your present assignment during the year.
3. Use a rating of "1" if you spend "very much below average" amount of time on a task. Use a rating of "2" for "below average" time; and so on, up to a rating of "7" if you spend "very much above average" amount of time on the task.
4. Remember you are to rate only tasks that you have already checked in the first column of pages 1 through 9.
5. Place your rating according to the 7-point scale, in the right-hand column, headed "Time Spent Current Assignment."
6. When you have completed all your ratings in the right-hand column of pages 1 through 9, you will have completed this Job Inventory, and you may turn it in to your Director or Dean of Vocational-Technical Education.
7. An envelope is provided for returning the Job Inventory and it may be sealed before returning it to your director who will mail it.

APPENDIX A (continued)

JOB INVENTORY

Postsecondary Vocational-Technical Instructor's Competency List		Page 6 of 9
The task (competency you perform now (✓) In the "Time Spent" column, rate only those competencies you have checked (✓) in your present assignment	Check ✓ IF DONE NOW	Estimated time spent on competencies in your assignment this year. 1. Very much below average 2. Below average 3. Slight below average 4. Average 5. Slightly above average 6. Above average 7. Very much above average

1. Check (✓) only those competencies which you perform in your present assignment.
2. Do not rate any competencies until you have checked (✓) each competency that you perform.
3. Use numbers "1" through "7" to indicate the amount of time you spent on each competency which you have checked. (✓)

MANAGEMENT (Continued)

56. prepare purchase request for approved vocational equipment and supplies. (37) ______
57. structure a filing system for records and report forms used in a vocational course. (38) ______
58. supply administrators with data for vocational reports required by the state department of education. (39) ______
59. provide approved safety apparel and devices for vocational students assigned to hazardous equipment. (40) ______
60. maintain a record of safety instruction presented in compliance with safety laws and regulations. (41) ______
61. uphold acceptable standards of student behavior in vocational classrooms and laboratories. (42) ______
62. maintain an inventory of vocational tools, supplies, and equipment assigned to the laboratory. (43) ______
63. establish a system for repairing and servicing tools and equipment in a vocational laboratory. (44) ______
64. arrange for the storage and security of vocational supplies and equipment. (45) ______
65. implement student "check-out" procedures for tools, supplies, and equipment used in the vocational laboratory. (46) ______
66. schedule laboratory equipment for maximum utilization by students. (47) ______

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APPENDIX B

APPENDIX B

EXAMPLE OF A

PROFESSIONAL IMPROVEMENT NEEDS ASSESSMENT

of

Community/Junior College and Technical Institute Student Services Personnel

INSTRUCTIONS

First:

For each of the statements on the survey form, please indicate, by placing a circle around the number, which best represents your present level of knowledge or ability for the statement. The statements should be rad with the thought in mind "I know this information .../ I am able to ...." If the statement is not applicable to your position, circle "NA".

Second:

For each of the statements on the survey form, please indicate, by placing a circle around the number, which best represents your desired level of knowledge or ability for the statement. The statements should be rad with the thought in mind "I should know .../ I should be able to ...."

Note: Your present level and desired level of each applicable statement should be rated according to the following scale:

Low	Below Average	Average	Above Average	High
1	2	3	4	5

Due to the limited time for planning, conducting, and reporting the needs assessment, the knowledge/competency statements are minimum. Therefore, space has been provided for you to add knowledge/competency statements which you feel are important.

PROFESSIONAL IMPROVEMENT NEEDS ASSESSMENT - Continued

Knowledge/Competency by Functional Area	Present level of Competency	Desired level of Competency
	NA 1 2 3 4 5	NA 1 2 3 4 5
Reporting and Research		
Student Tracking	NA 1 2 3 4 5	NA 1 2 3 4 5
Follow-up	NA 1 2 3 4 5	NA 1 2 3 4 5
Follow-up	NA 1 2 3 4 5	NA 1 2 3 4 5
______________	1 2 3 4 5	1 2 3 4 5
______________	1 2 3 4 5	1 2 3 4 5
______________	1 2 3 4 5	1 2 3 4 5

I would prefer to achieve the desired level of knowledge/competency by attending: (please rank by preference using a scale of 1 to 4, with 1 being the highest preference)

Regional Workshop ___ College Courses ___ State-wide Workshops ___
Locally Conducted Workshops ___

Please return to:
Dr. Bill E. Lovelace
Project Director
School of Human Resource Management
University of North Texas
P.O. Box 5248
Denton, TX 76203

PROFESSIONAL IMPROVEMENT NEEDS ASSESSMENT

of
Postsecondary
Student Services Personnel

Please check (√) the title below that best describes your present assignment:

Administrator ____ Counselor ____ Job Placement Coordinator ____
Instructor ____

Knowledge/Competency by of Functional Area	Present level of Competency						Desired level Competency					
	NA	1	2	3	4	5	NA	1	2	3	4	5
Counseling Center Services												
Referral/Community Agencies	NA	1	2	3	4	5	NA	1	2	3	4	5
Referral Networking/Faculty	NA	1	2	3	4	5	NA	1	2	3	4	5
Assistance with Substance Abuse	NA	1	2	3	4	5	NA	1	2	3	4	5
Crisis Intervention	NA	1	2	3	4	5	NA	1	2	3	4	5
____												
____												
____												
Career Placement Services												
Career Assessment	NA	1	2	3	4	5	NA	1	2	3	4	5
Career Development Courses	NA	1	2	3	4	5	NA	1	2	3	4	5
Career Library	NA	1	2	3	4	5	NA	1	2	3	4	5
Transition Counseling	NA	1	2	3	4	5	NA	1	2	3	4	5
Job Bank Data	NA	1	2	3	4	5	NA	1	2	3	4	5
Job Development	NA	1	2	3	4	5	NA	1	2	3	4	5
Career Days	NA	1	2	3	4	5	NA	1	2	3	4	5
Resume Preparation	NA	1	2	3	4	5	NA	1	2	3	4	5
Job Interviews	NA	1	2	3	4	5	NA	1	2	3	4	5
Placement Files	NA	1	2	3	4	5	NA	1	2	3	4	5
Job Placement Services	NA	1	2	3	4	5	NA	1	2	3	4	5
____		1	2	3	4	5		1	2	3	4	5
____		1	2	3	4	5		1	2	3	4	5
____		1	2	3	4	5		1	2	3	4	5

APPENDIX C

Appendix C

PROFESSIONAL IMPROVEMENT NEEDS OF INSTRUCTORS CONDUCTING COOPERATIVE EDUCATION

NEEDS ASSESSMENT, CATEGORY J
(INDEXED BY SPECIFIC N)

tatement Number	N	Task/Competency Statement	Need Index	Priority
J6	87	Develop the Training Ability of On-the-Job Instructors	9.95	1
J5	144	Place Co-op Students at Training Stations	9.40	2
J4	139	Secure Training Stations for Cooperative Education Students	9.10	3
J10	80	Supervise an Employer-Employee Appreciation Event	8.65	4
J9	111	Prepare for the Cooperative Education Students' Related (Occupational Theory, etc.) Instruction (Seminars, Classrooms, Laboratory)	8.30	5
	113	Coordinate On-the-Job Instruction with Institutional Instruction	7.85	6
J8	126	Evaluate Coop Students' On-the-Job Performance	7.60	7
J1	120	Establish Guidelines for Your Cooperative Technical/Vocational Program	7.55	8
J3	128	Enroll Students in Cooperative Education	7.50	9
J2	123	Manage the Attendance, Transfers, and Terminations of Co-op Students	7.15	10

Source: **SUMMARY REPORT OF THE POSTSECONDARY TECHNICAL/VOCATIONAL PERSONNEL ASSESSMENT PROJECT conducted by the University of North Texas, 1992.**

APPENDIX D

Appendix D

Program installation evaluation is an observation of project activity as it compares with the program standards for each task constituting stage one.

Process evaluation, stage two, enlists the aid of program staff in flow charting the relationship between objectives and tasks.

Product evaluation, stage three, utilizes the traditional experimental design to determine if the project achieved its objectives.

As each stage of evaluation is implemented, three dimensions will be considered. These dimensions are input, process, and output. Basically, input variables consist of resource allocations while process variables depict the methodology. Output will employ three stages: installation, process, and product, that will be considered in terms of input, process, and output variables. Application of the discrepancy evaluation model will produce evaluative data for each stage - installation, process adjustment, and product assessment, for review by the Project Advisory Committee and the third party evaluator.

An overview of the proposed evaluation plan is presented on the following pages. The plan includes the specifics of the proposed design, installation, process, and product evaluation in terms of specified items for review, time frame for review, persons involved in review, and sample evaluative criteria. The project director will meet with the Project Staff Advisor prior to the end of the second month of the project to finalize the evaluation plan. A third party evaluator will be responsible for the evaluation.

: EVALUATION PLAN

Evaluation Techniques

OVERVIEW OF EVALUATION PLAN
General Information

Type of Evaluation	Item for Review	Time Frame	Persons Involved Review	Sample Criterial Questions
Process Evaluation	List of members of Project Advisory	15 DAYS	3rd Party Evaluator	Are the members of the Project Advisory Committee representative of the agencies or organizations recommended by the RFP?
Process Evaluation	Reports	2-3 months	CB Project Manager	Were reports submitted within the timeframe specified?
Product Evaluation	Procedures	1-3 months	Project Advisory Committee, Staff, 3rd Party Evaluator	Were the project products in accordance with specified procedures stated in the proposal?

EVALUATION PLAN

Evaluation Techniques

OVERVIEW OF EVALUATION PLAN
General Information

Type of Evaluation	Item for Review	Timeframe Review for (Months after Start)	Persons Involved Review	Sample Criterial Questions
Product Evaluation	Project Products	3 months	Project Advisory Committee, Staff	Were products developed as proposed? Was Sufficient information provided to monitor the project performance? Did the reports comply with the specifications stated in the proposal? Did the final report comply with the project Assurances?

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APPENDICES

APPENDIX A

TEXAS DEPARTMENT OF COMMERCE
Skill Standards and Certification Project

FIRST QUARTERLY REPORT

Institution Name:	Texas Instruments
Project Name:	Skills Standards and Certification Project (Electronic Technician)

1. Progress to Date

As referenced in the proposal, all activities on this project could not begin until after funding approval and the ACT Work Keys' Occupational Profiles were completed. With funding approval, Wayne Freeland and Jessie Teddlie met with the Tri-Agency Representatives, David Dennis, Mark Butler, and Joan Hassenflu for budget finalization and proposal revisions in Austin, Texas. Recommended revisions and final budget pages were transmitted to the Department of Commerce and the contract was official. Texas Instruments Bidder contact, Wayne Freeland, contracted with the University of North Texas as detailed in the proposal. These were finalized with the beginning date of January 21, 1994.

The ACT Job Profiling activity took place at the Texas Instruments' Plant in Dallas, Texas beginning on March 8th with a tour to view the technicians in the work place and was finalized on March 9th with the technicians who volunteered to be a part of the contract. The list of names and companies are attached to this report with the Profile developed by ACT. Also present at the profiling session as observers were David Dennis from the Department of Commerce, Wayne Freeland as the Bidder representative, Jessie Teddlie as the Project Director from the University of North Texas, Abby Ray and Marcy Hart from the Job Enhancement Program at Texas Instruments, and two representatives from the Texas A & M Third Party Evaluator Contract. Each of the technicians were given a Certification of Participation from the University of North Texas for their contributions to this project. A sample of the certificates is in the attachments to this report.

The fact that the ACT Profiling was delayed prevented the Project Staff from meeting the specified date for completion of the SCANS Occupational Profile Analysis. This also delayed the the Contractor's Training to March 23-24, 1994, in Austin, Texas at the offices of the Texas Higher Education Agency. The agenda from that meeting is located with the attachments to this report. The representatives from this project who attended this meeting were Wayne Freeland, Abby Ray, Kathy Price, and Marcy Hart from Texas Instruments; Jessie Teddlie and Bill E. Lovelace from the University of North Texas; and Earl Hines from Texas State Technical College in Sweetwater representing the Community/Technical College Consortium, TEAM.

Commitment letters from the other members of the Consortium have been received and plans are being drafted to have our first meeting with the Focus Group from the Consortium. The date, time and site of that meeting will be provided to the Project Staff Advisor and the procedures will begin in April. The SCANS Occupational Profile Handbook will be completed as per completion date.

2. Staff Advisor and Assistance

David Dennis, the Contact Staff Advisor for the Tri-Agency project has been helpful. The Third Party Evaluator Project Team has offered assistance and is planning site visits.

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March 10, 1993

To: Jessie Teddlie

Fr: Marcy Hart

RE: Selection process for technicians for ACT interviews

To select the technicians for the interviews, we used this process:

> Contact the cost center managers to ask for a recommendation list of potential candidates. Candidates were to represent a mix on the following factors: years of service at TI, job grade, and career track (specialist vs. generalist.) We then selected a group of techs who would provide a variety based on those three factors.
>
> Additionally, we asked the managers to recommend techs that they thought would do well in an interview process. While we stressed that we did not need the most articulate/verbal people, we did need people who were at least proficient on that factor.

I hope this helps. If you need more info, call me at 462-4977. Thanks.

Marcy

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ELECTRICAL ENGINEERING TECHNICIAN

Focus Group List

Draft - March 3, 1994
Page 1 of 2

✓ Mr. Sergio Castro
Test Technician
Marlo Industries
10451 Vista Park Road
Dallas, Texas 75238

✓ Mr. James Abshire
Texas Instruments
M/S 3436
2501 S. Highway 121
Lewisville, Texas 75067

✓ Mr. Luis Martinez
Texas Instruments
M/S 3436
2501 S. Highway 121
Lewisville, Texas 75067

✓ Mr. Mike Quattlebaum
Texas Instruments
M/S 3466
2501 S. Highway 121
Lewisville, Texas 75067

✓ Mr. Curt Larsen
Texas Instruments
M/S 8090
2501 West University
McKinney, Texas 75070

✓ Mr. Michael Peters
Texas Instruments
M/S 8061
2501 West University
McKinney, Texas 75070

✓ Mr. Mike ~~Oberville~~ Sherville.
Texas Instruments
M/S 8056
2501 West University
McKinney, Texas 75070

ELECTRICAL ENGINEERING TECHNICIAN

Focus Group List

Draft - March 3, 1994

Page 2 of 2

NC Mr. Kelly Beebe
Electrical Engineering Technician
Abbott Labs
1921 Hurd Drive, M/S 2-30
Irving, Texas 75015

✓ Mr. John McLaughlin
Electrical Engineering Technician
Abbott Labs
1921 Hurd Drive, M/S 2-11
Irving, Texas 75015

University of North Texas

Certificate of Completion

This certificate is awarded to

Sergio Castro

for completion of 8 clock hours of professional development in

Skills Standards and Certification for

Electrical/Engineering Technicians

on

March 9, 1994

Jessie Teddlie, Ph.D.

TEXAS DEPARTMENT OF COMMERCE
Skill Standards and Certification Project

SECOND QUARTERLY REPORT

Institution Name: Texas Instruments

Project Name: Skills Standards and Certification Project (Electronic Technician)

1. Progress to Date

The Focus Group who worked on the **Analysis Committee** met in Denton on April 29, 1994, and those present were Marcy Hart and Abby Ray from Texas Instruments, Earl Hines from TSTC-Sweetwater, Billy Giles from Weatherford College, Arnulfo (Arnie) Garcia from TSTC-Harlingen, and Enrique Garcia from Laredo Junior College. The Committee took the EIF Skill Standards and developed **Task Analysis Sheets** for each one based on the current curriculum used in the community colleges. The Task Analysis sheets were used in the development of the Electronic Technician profiling for SCANS levels as well as other entry level skills already researched. The draft copies of the *SCANS Occupational Profile Handbook* were distributed to all interested parties for format recommendations and no changes were recommended.

The Handbook was then completed and mailed with this report to David Dennis (7 copies), Wayne Freeland (4 copies to be shared with the participating businesses/industries), Abby Ray, Marcy Hart, Earl Hines, Billy Giles, Arnie Garcia, Enrique Garcia, Molly Monnon with EIF, the Third Party Evaluators at Texas A & M, and to Mr. Melton with ACT. The **Handbook** includes the evidenced identification of educational levels and correlation necessary to continue with the Curriculum Phase and the completion of the project.

There will be a Focus Group brought together in order to analyze the current curriculum(s) to determine deficiencies which might exist. The Focus Group (Task Force) with the Project Staff will make provide a list of any found deficiencies to be used in the curriculum enhancement recommendations. Then the writers will be brought together to continue with the phases of the project. No problems are anticipated.

David Dennis has confirmed that the contract will be continued through December 30, 1994, with the attached amended budget. With this approval, the Project Staff will continue to the Curriculum portion of the proposal.

There has been a Third Party Evaluator's meeting scheduled for July 13, 1994, in Denton, and a Contractors' Training meeting set for August in Austin, Texas.

2. Staff Advisor and Assistance

David Dennis, the Contact Staff Advisor for the Tri-Agency project has been helpful. The Third Party Evaluator Project Team has offered assistance and is planning site visits.

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TEXAS DEPARTMENT OF COMMERCE
Skill Standards and Certification Project

THIRD QUARTERLY REPORT

Institution Name: Texas Instruments

Project Name: Skills Standards and Certification Project (Electronic Technician)

1. Progress to Date

The final draft of the Handbook has been submitted, the draft of the Curriculum Enhancement has been submitted even though there will be other "Basic Course Outlines" added. The educational specialists met for the Curriculum/Discrepancy tasks on July 28, 1994, for the TEAM. The JEP Curriculum specialists met at Texas Instruments and followed the same process as well as getting a complete report of the total processes used by the specially trained educational staff and their methodologies. The educational specialists for TEAM did not get all of the documents to the project staff in time to include in draft. We are involved in revisions of that document, drafting the Staff Development Plan, and looking at the Strategies in the assessment section.

The project staff, third party evaluators, and the educational specialists also met with the EIF National Standards group in Dallas on July 29, 1994, and participated in the large group discussions on Certification Strategies. The summary of that meeting is attached.

A second meeting of the educational specialists and other members of the TEAM was held on October 8, 1994, in order to complete tasks and to receive input from additional members of the TEAM concerning all completed and draft documents as well as ideas on certification strategies and professional development plans.

2. Staff Advisor and Assistance

David Dennis, the Contact Staff Advisor for the Tri-Agency project has been helpful. The Third Party Evaluator Project Team has offered assistance and is planning another site visit.

3. Problems:

There have been no real problems to date with the exception that the specialists did not complete samples for Curriculum package on time.

Project Director

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Date

APPENDIX B

AGENDA

Curriculum Analysis Meeting
July 28, 1994

9:30 - 10:00	Introductions/Overview
10:00 - 11:00	Task Review and Forms
11:00 - 11:30	Tasks Groups
11:30 - 1:00	LUNCH
1:00 - 3:00	Tasks Groups
3:00 - 3:30	Summary/Closing

MINUTES

CURRICULUM ANALYSIS MEETING
University of North Texas
July 28, 1994

The meeting was called to order by Dr. Jessie Teddlie, the project director, and all introductions were made. The days' agenda and expected task completions were presented as an overview by Dr. Teddlie. The documents and forms needed to for the task completion were explained and time was allowed for questions.

The specialists present at this meeting were:

Earl Hines, Sweetwater TSCT
Billy Giles, Weatherford College
Enrique Garcia, Larado College
Enulfo Garcia, Harlingen
Marcy Hart, Texas Instruments
Abby Ray, Texas Instruments
Pat McLeod, University of North Texas
Bill Lovelace, University of North Texas

The forms required for completion with this phase of the project were divided into two groups and the specialists began the tasks. The specialists were responsible for completing all forms and mailing them to Dr. Jessie Teddlie.

The meeting was adjourned at 4:00 p.m. by Dr. Bill Lovelace.

Discrepancy Analysis Sheet

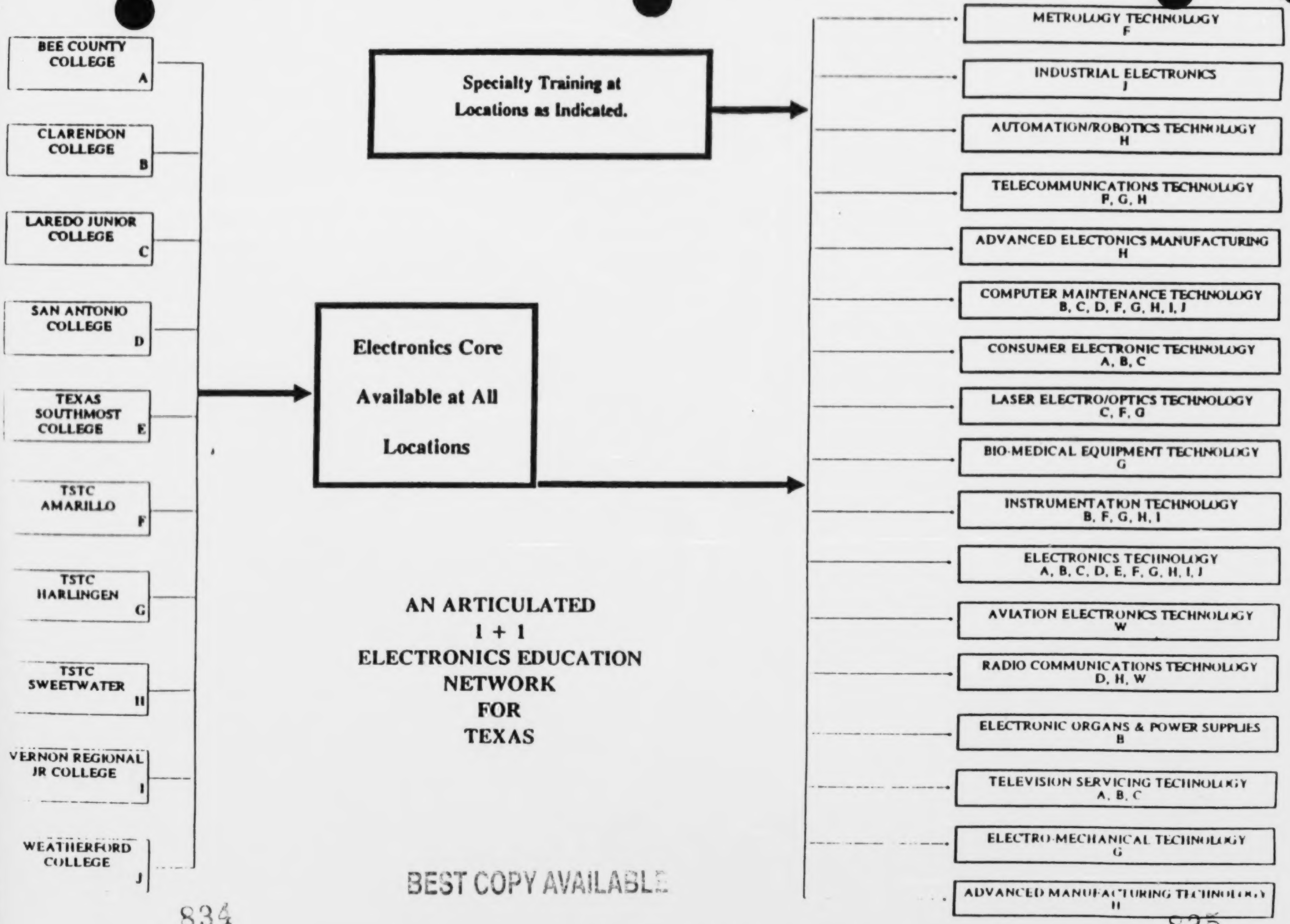
EIF Skills Standards		TEAM Electronics Curriculum						
				Performance Objective			Included in TEAM	
Code	Standard	Course #	Unit #	Code	Statement	SCANS Competency Required	Yes	No

TEAM Electronic Curricula -- SCANS Enhancement

EPI#	Course #	Unit #	Performance Objective Code	SCANS Competency to be added	SCANS Performance Objective	Suggested Method of Instruction

Discrepancy Analysis Sheet

EIF Skills Standards		TI JEP for Electronic Technician						
				Performance Objective			Included in TEAM	
Code	Standard	Course #	Unit #	Code	Statement	SCANS Foundations Required	Yes	No


BEE COUNTY COLLEGE A
CLARENDON COLLEGE B
LAREDO JUNIOR COLLEGE C
SAN ANTONIO COLLEGE D
TEXAS SOUTHMOST COLLEGE E
TSTC AMARILLO F
TSTC HARLINGEN G
TSTC SWEETWATER H
VERNON REGIONAL JR COLLEGE I
WEATHERFORD COLLEGE J
Specialty Training at Locations as Indicated.
Electronics Core Available at All Locations
METROLOGY TECHNOLOGY F
INDUSTRIAL ELECTRONICS J
AUTOMATION/ROBOTICS TECHNOLOGY H
TELECOMMUNICATIONS TECHNOLOGY F, G, H
ADVANCED ELECTONICS MANUFACTURING H
COMPUTER MAINTENANCE TECHNOLOGY B, C, D, F, G, H, I, J
CONSUMER ELECTRONIC TECHNOLOGY A, B, C
LASER ELECTRO/OPTICS TECHNOLOGY C, F, G
BIO-MEDICAL EQUIPMENT TECHNOLOGY G
INSTRUMENTATION TECHNOLOGY B, F, G, H, I
ELECTRONICS TECHNOLOGY A, B, C, D, E, F, G, H, I, J
AVIATION ELECTRONICS TECHNOLOGY W
RADIO COMMUNICATIONS TECHNOLOGY D, H, W
ELECTRONIC ORGANS & POWER SUPPLIES B
TELEVISION SERVICING TECHNOLOGY A, B, C
ELECTRO-MECHANICAL TECHNOLOGY G
ADVANCED MANUFACTURING TECHNOLOGY H

AN ARTICULATED
1 + 1
ELECTRONICS EDUCATION
NETWORK
FOR
TEXAS

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TI INSTRUCTORS DISCREPANCY ANALYSIS FOR CURRICULUM ENHANCEMENT MEETING

August 19, 1994
Texas Instruments
Lewisville, Texas

The meeting was called to order by Jessie Teddlie, project director, for the purpose of completing a discrepancy analysis of the curriculum taught by the Job Enhancement Program at Texas Instruments. The purpose of the meeting and all forms were explained by the project director.

The teacher training program at Texas Instruments for the Job Enhancement Program was explained by Kathy Price in order to evaluate the methodologies utilized by the Texas Instruments instructors in presenting the curriculum and job enhancement educational program.

The recruitment and educational process was explained by Marcy Hart and the discrepancy analysis of curriculum was started. The instructors were to complete the documents and return them to the project director for review.

The meeting was closed so participants could complete the tasks.

TI DISCREPANCY ANALYSIS MEETING

The new instructors for the JEP program are put into a two week, approximately 80 hour training program which covers the learning objectives for the courses to be taught at the site. Then the new instructor is placed with a "mentoring team" for at least one year. The training is done by modeling the methods expected to be used by the instructors on the job.

The teacher's role includes training the instructors as to the differences of the teacher's role in regular educational institutions to the teacher's role on the worksite training program. The worksite teacher's role includes a "six hat role", lateral thinking, flexible thinking and the needs. This is done through a "puzzle activity" which talks about the roles of the business educator must be able to handle including a analysts who puts data and statistics together for management, a job task analyst, curriculum writer, curriculum analyst, curriculum developer, a classroom teacher, a public relations provider.

The adult learning unit includes theories about learning styles and adult learners. Theories are based on Knowles' theories of adult learning and about Gardner's Theory of Multiple Intelligence. Time is spent making the instructor's aware that their major role is that of facilitator and that hand-on activities are used more than traditional lecture (information provider) methods. Multi-sensory learning and teaching must be used.

The process unit includes the scope and sequence used by using an umbrella activity which includes all of the aspects including language used for all scope and sequence. Then, a process for writing a Job Training Analysis. Surveys are not used, but on-site meetings with managers, then supervisors, and then employees in the job duty or title being analyzed. Then, a verifying process is completed by another tour viewing the employees completing their job and collecting documents used in the job procedures. The process is time consuming and interviewing skills must be fine tuned to gather the information in the process. The new instructors are trained as to how to interview for the information needed. Job Training Analysis (JTA) takes approximately 45 to 60 days to be completed through all cycles.

The assessment training makes the instructors aware of how the idea of assessment is an emotional issue in the worksite (red hat), how an assessment and a test are different, how to verbalize the differences, process for designing an assessment from the JTA, and how to create a Table of Test Specifications. The assessments show "skill gaps" or deficiencies. The individual profiles are used to provide the instructional materials. Assessments like one for reading assessment must be developed using worksite materials or relationships. Using packing slips shows only job knowledge but using other documents not used so frequently would show reading skills. The ratings are either proficient or re-cycle, not grades. Individual feedback would be practiced in instructors training as well.

Course work training includes transferability of training. Army sources and research shows using work related documents work best and instructors are trained in this method. This is called the Learning Objectives portion of training. Instructors are then taught to develop course/lesson outlines.

New Instructor Training

This New Instructor Training Manual was developed for TI's Job Enhancement Program. In preparing this training, the training team considered not only the information which a new instructor would need but also considered the style in which training would be delivered. It was the goal of the training team to model the type of instructing or facilitating that instructors would use in the classroom. This included building on the expertise of the participants, using discovery learning, developing training that allowed for different learning styles, and involving the participants in problem solving and team work.

Using a modeling style of training, the New Instructor Training was designed to:

Give new instructors a feeling for the many roles they would play in the Job Enhancement Program.

Give new instructors and the JEP team a method of communication through the use of "hats".

Provide background/historical information on JEP and on workplace programs.

Make new instructors aware of adult learning (pedagogy) theory.

Make new instructors aware of learning styles and learning differences.

Explain the process that the Job Enhancement Program uses. (Scope and Sequence, JTA, Assessment, Courses)

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Teacher Role

At the conclusion of this section of training the instructor should:

- Be familiar with the work environment.
  - Understand how JEP fits into TI.
  - Be familiar with the history of TI.
  - Understand information in TI information packet.
  - Meet other JEP personnel.

- Understand the many roles of the job.

- Understand need for flexible thinking.

- Understand the philosophy of working in a team.

- Understand how changing technology affects industry & business.

- Understand reasons & scope of workplace education.

Adult Learner and Adult Education

At the conclusion of this training, the instructor should:

- Understand how changing technology affects industry and business.
- Understand reasons and scope of workplace education.
- Understand how pedagogy differs from andragogy.
- Know characteristics of adult learners.
- Use inclusive language.
- Understand the concept of multiple intelligence.
- Know varied populations addressed by JEP.
  - Understand meaning of Learning Differences.
  - Be aware of characteristics of Learning Different employees.
  - Be aware of educational experiences of Learning Different employees.
  - Understand learning needs of Learning Different employees.
  - Recognize the indicators of employees who speak English as a second language (ESL).
  - Recognize needs of hearing impaired employees.

SCOPE AND SEQUENCE

At the conclusion of this training section the instructor should:

- Define the meaning of Scope and Sequence.
- Relate Scope and Sequence to JTA, assessment, and curriculum.
- Know the process for changing Scope and Sequence.

Job Task Analysis (JTA)

At the conclusion of this section of training the instructor should:

- Understand the JTA process
- Determine the reading, writing, listening, speaking, and math skills of a job task
- Understand written JTA format
- Use Scope and Sequence terminology for writing JTAs
- Know a variety of questions to ask during interviews
- Be familiar with types of responses and know how to elicit more information from response
- Know where to Find workplace documents
- Use inclusive language

ASSESSMENT

At the conclusion of this section, the instructor should:

- Appreciate the emotional climate surrounding assessment.
- Know how an assessment and a test are different.
- Verbalize the difference between a test and an assessment.
- Know relationship of assessment to JTA.
- Know and use the 5 step process of designing work-related assessments.
- Create a Table of Test Specifications.
- Use different types of test questions.
- Know where to locate different industry and life material sources.
- Use workplace documents to write assessment questions.
- Know educational standards of assessment writing.
- Know practice assessment and assessment process.
- Understand assessment scoring (P, R, M, C).
- Understand a process for checking content validity.
- Know how item analysis can be used to evaluate assessments.
- Know and use raw data to develop test stats.

LEVELS OF EVALUATION
Texas Instruments JEP

Level I: Typical evaluation sheet at end of training/unit which asks such questions as how were the facilities, how was the trainer, did I get what I needed, type of questions. TI calls this a smiley face evaluation.

Level II: Pre-survey and post-survey for measuring learning gains

Level III: How can we measure competency learned? How can we go back to the worksetting and see that it is learned? Example: Took a technical writing class - if we go to the worksetting and look at their memo(s) developed after the training, can we "see" that the competency was learned and is long-term.

Level IV: Requires management checks and systems which are not totally in place. Example: Took a machinist key boarding unit - pre-survey showed how many strokes it took and in how much time. Then post-survey would show how long it took after the training. Say it saved 5 seconds for each person, times 300 machinists, how much time was saved over a period of a week, a year, etc. and is that data needed in that example. Can the managers "see" that the people are faster and therefore data presented would be wasted time and energy to collect and present. However, there are situations where the gains would be worth documenting for management.

Learning Objectives

At the conclusion of this unit, the instructor will:

State reasons for using work related curriculum.
  - Identify studies and researchers of transferability.
  - List theories given by Knowles that support using work related curriculum.
  - State ways that work related curriculum differs from school based curriculum.
  - Identify ways strategic thrusts of business/industry can be undergirded by curriculum.

Write curriculum using six step process.
  - State reasons for using a development process.
  - List and define the six steps in the curriculum development process.
  - Define customer needs in terms of curriculum purpose.
  - Transfer customer needs into competencies that are work related and measurable.
  - Develop course outline including prerequisite and requisite skills.
  - Write learning objectives that are measurable and lead to competencies.
  - Create learning activities for learning objectives.
  - Develop four levels of evaluation for curriculum.

Apply business/industry quality models to curriculum process and standards.
  - Identify business/industry quality measures.
  - Create a curriculum development process model that includes quality measures.
  - Create curriculum standards.

All curriculum will be written to the standards established by (name of company).

CLASSES

- Know how pedagogy differs from andragogy.
- Know characteristics of adult learners.
- Know process for setting up class.
- Know materials needed to start class.
- Know administrative requirements during class.
- Understand atmosphere of class.
- Know process for ending class.

JOB ENHANCEMENT
Patterns of Writing
Objectives
12 hours

1. Participants will identify and spell workplace words containing regular spelling patterns.

2. Participants will identify and spell workplace words containing rule spelling patterns.

3. Participants will identify and spell workplace words containing irregular spelling patterns.

JOB ENHANCEMENT
Writing Workplace Documents
12 hours

Purpose

The purpose of this workshop is to teach a writing process used to fill-out workplace documents.

Competency

At the conclusion of this workshop, participants will be able to write clear and concise workplace documents using a process.

Learning Objectives

The participant will . . .
- plan the document
- organize information
- write a rough draft
- edit the draft
- format the document
- practice/apply the process

JOB ENHANCEMENT
Developing a Presentation
9 hours

Purpose: The purpose of this module is to teach participants a process for developing presentations.

Competency: At the end of this module, the participant will be able to use a process to develop a presentation.

Learning Objectives: The participant will:

1. understand the importance of pre-planning a presentation.
2. understand different presentation purposes.
3. identify the needs of audience members.
4. brainstorm a presentation topic.
5. brainstorm opposing viewpoints.
6. develop the parts of a presentation.
7. understand methods for adding interest.
8. determine a method for organizing a presentation.
9. create cheat sheets for a presentation.

Course Outline

I. Pre-plan the presentation
    A. Determine purpose
    B. Analyze audience
    C. Brainstorm the topic

II. Develop the presentation
    A. Assimilate the parts
        a. Opening
        b. Body
        C. Close
    B. Add interest
    C. Brainstorm opposing viewpoints
    D. Add interest
    E. Create cheat sheets

JOB ENHANCEMENT
Objectives for Course
12 Hours

Editing Workplace Documents

1. Edit Documents for "Big Step" procedure
   - Audience
   - Purpose
   - Organization
   - Format

2. Edit documents for "Middle Step" procedure
   - Simplicity
   - Clarity
   - Conciseness

3. Edit documents for "Little Step" procedure
   - Grammar
   - Capitalization
   - Punctuation
   - Spelling

AGENDA

South Padre Island
October 8, 1994

TEAM EDUCATIONAL SPECIALISTS

Curriculum Enhancement/Certification Strategies Meeting

8:30 a.m. - 9:00 a.m.	Overview/Coffee
9:00 a.m. - 11:00 a.m.	Review of Handbook
11:00 a.m.- 11:30 a.m.	Review of Curriculum Enhancement Document
11:30 a.m.- 1:00 p.m.	Lunch
1:00 p.m.- 3:00 p.m.	Curriculum/Certification/Staff Development Ideas
3:00 p.m.- 3:30 p.m.	Closure/Document Control

APPENDIX C

FINAL REPORT LIST

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TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
ALAMO SDA			
Mr. Gil Sanchez, Interim Chief Executive Officer Alamo Workforce Development Council, Inc. 215 South San Saba (Zip: 78207) P. O. Box 839966 San Antonio, Texas 78283-9966 (210) 554-7100 FAX: (210) 554-7638	Same as Grant Recipient	Mr. Mike de la Garza, PIC Chairperson Vice President Public Afairs H.E.B. Grocery Company 646 South Main San Antonio, Texas 78283 (210) 246-8060 FAX: (210) 246 8169	Honorable Nelson Wolff Mayor, City of San Antonio Military Plaza P. O. Box 839966 San Antonio, Texas 78283 9966 (210) 299-7040 FAX: (210) 270 4077
AUSTIN/TRAVIS COUNTY SDA			CHIEF ELECTED OFFICIALS
Mr. Alan D. Miller, Executive Director Austin/Travis County PIC 2015 South IH-35, Suite 300 Austin, Texas 78741 (512) 440-7816 FAX: (512) 440 9299	Same as Grant Recipient	Mr. Kwaku Agbottah, PIC Chair 1106 Clayton Lane, Suite 242W Austin, Texas 78723 (512) 454-7000 FAX: (512) 454 4842	Honorable Bruce Todd Mayor, City of Austin P. O. Box 1088 Austin, Texas 78767 1088 (512) 499 2250 FAX: (512) 449 2337 Honorable Bill Aleshire Travis County Judge P. O. Box 1748 Austin, Texas 78767 1748 (512) 473-9555 FAX: (512) 473 9535
BRAZOS VALLEY SDA			
Mr. Roy W. Kelly, PIC Chair Brazos Valley Private Industry Council, Inc. 504 East 27th Street Bryan, Texas 77803-4025 (409) 779-7443 FAX: (409) 822-7758	Mr. Dale J. Marsico, Chief Administrator & JTPA Program Director Brazos Valley Private Industry Council, Inc. 504 East 27th Street Bryan, Texas 77803 4025 (409) 779 7443 FAX: (409) 822 7758	Same as Grant Recipient	Honorable R. J. Holmgreen Brazos County Judge Brazos County Courthouse 300 East 26th Street, Suite 114 Bryan, Texas 77803-5359 (409) 775-7400 FAX: (409) 823 6993

TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

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CAMERON COUNTY SDA			
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TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

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CITY OF DALLAS SDA			
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JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

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TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

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JOB TRAINING PARTNERSHIP ACT

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Honorable J. Edgar Ruiz Hidalgo County Judge Hidalgo County Courthouse P. O. Box 1356 Edinburg, Texas 78539-1356 (210) 318-2605 FAX: (210) 318-2699	Mr. Hollis Rutledge, Executive Director Office of Employment and Training 1899 North Cage (Rear) Pharr, Texas 78577 P. O. Box 1166 Edinburg, Texas 78540-1166 (210) 702-5100 FAX: (210) 702-5184	Mr. Hector Cavazos, PIC Chair Mission Auto Electric P. O. Box 1615 Mission, Texas 78573-1615 (210) 607-8396 FAX: (210) 585-3044	Same as Grant Recipient

TEXAS DEPARTMENT OF COMMERCE

JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
CITY OF HOUSTON SDA			
Mr. Terry Hudson, Executive Director & JTPA Program Director City of Houston SDA Houston Job Training Partnership Council 1919 Smith Street, Suite 500 Houston, Texas 77002-8050 (713) 654-1919 FAX: (713) 655-0715	Same as Grant Recipient	Mr. Walter H. Criner, PIC Chair Criner-Daniels & Associates, Inc. P. O. Box 740503 Houston, Texas 77274-0503 (713) 787-0900 FAX: (713) 787-0159	Honorable Bob Lanier Mayor, City of Houston 901 Bagby (Zip: 77002) P. O. Box 1562 Houston, Texas 77251-1562 (713) 247-1888 FAX: (713) 247-2676
LUBBOCK/GARZA COUNTIES SDA			
Mr. Donald J. McCullough, Executive Director & JTPA Program Director JobSource + Lubbock/Garza Counties PIC 1218 14th Street Lubbock, Texas 79401-3201 (806) 765-5038 FAX: (806) 765-6944	Same as Grant Recipient	Mr. Barry Ballinger, PIC Chair Plains National Bank 5010 University Avenue Lubbock, Texas 79413 (806) 795-7131 FAX: (806) 791-7382	Honorable David R. Langston Mayor, City of Lubbock 1625 13th Street (Zip: 79457) P. O. Box 2000 Lubbock, Texas 79457-2000 (806) 762-6411 FAX: (806) 767-2051
MIDDLE RIO GRANDE SDA			
Mr. Leodoro Martinez, Executive Director Middle Rio Grande Development Council 1904 North First Street P. O. Box 1199 Carrizo Springs, Texas 78834-1199 (210) 876-3533 FAX: (210) 876-9415	Same as Grant Recipient	Mr. Jose Luis Balderas, PIC Chair P. O. Box 386 Crystal City, Texas 78839-0386 (210) 374-5440 FAX: (210) 278-1583	Mr. John Ilse, Board President Middle Rio Grande Development Council P. O. Box 1199 Carrizo Springs, Texas 78834-1199 (210) 876-3533 FAX: (210) 876-9415

TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
NORTH CENTRAL TEXAS SDA			
Mr. Michael Eastland, Executive Director North Central Texas Council of Governments 616 Six Flags Drive (Zip: 76011-6303) P. O. Box 5888 Arlington, Texas 76005-5888 (817) 640-3300 FAX: (817) 640-7806	Mr. Barbara Vargas, Acting Manager North Central Texas Council of Governments 616 Six Flags Drive (Zip: 76011-6303) P. O. Box 5888 Arlington, Texas 76005-5888 (817) 640-3300 FAX: (817) 640-7806	Mr. Jack Miller, PIC Chair Jack D. Miller and Associates 1006 Burning Tree Parkway Denton, Texas 76201 (817) 387-4383 FAX: (817) 387-4383	Honorable Bill Lofland Rockwall County Judge Office of the County Judge Rockwall County Courthouse Rockwall, Texas 75087 (214) 722-5152 FAX: (214) 722-0242
NORTHEAST TEXAS SDA			
Mr. James C. Fisher, Executive Director Ark-Tex Council of Governments 911 Loop 151, Suite A (Zip: 75501) P. O. Box 5307 Texarkana, Texas 75505-5307 (903) 832-8636 FAX: (903) 832-3441	Same as Grant Recipient	Mr. James Smith, PIC Chair Northeast Texas SDA Highway 259 South (Zip: 75668) P. O. Box 204 Lone Star, Texas 75668-0204 (903) 656-6521 FAX: (903) 656-3355	Honorable James M. Carlow Bowie County Judge 100 North Stateline Avenue Texarkana, Texas 75501 (903) 793-7696 or 798-3040 FAX: (903) 628-6949
NORTH TEXAS SDA			
Mr. Dennis Wilde, Executive Director Nortex Regional Planning Commission Galaxy Oil Center #1, North 4309 Jacksboro Highway Wichita Falls, Texas 76302 (817) 322-5281 FAX: (817) 322-6743	Ms. Mona Statser, JTPA Program Director, Training and Job Development Nortex Regional Planning Commission Galaxy Oil Center #1, North 4309 Jacksboro Highway Wichita Falls, Texas 76302 (817) 322-5281 FAX: (817) 322-6743	Mr. Earl Nunneley, PIC Chair 601 W. Cedar Street (Zip: 76255) P. O. Box 59 Nocona, Texas 76255-0059 (817) 825-3222 FAX: (817) 825-3223	Honorable Joe Dickson Baylor County Judge Baylor County Courthouse Seymour, Texas 76380 (817) 888-2662 FAX: (817) 888-8856

TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
PANHANDLE SDA			
Mr. Gary Pitner, Executive Director Panhandle Regional Planning Comm. 2736 West 10th Avenue (Zip: 79102-1128) P. O. Box 9257 Amarillo, Texas 79105-9257 (806) 372-3381 FAX: (806) 373 3268	Mr. Tom Dressler, Director of Employment/Training Panhandle Regional Planning Commission 415 West 8th Street P. O. Box 9257 Amarillo, Texas 79105 9257 (806) 372-3381 FAX: (806) 373 3268	Mr. Edward Hamilton, PIC Chair President Amarillo Mastercraft Industries 503 Madison Amarillo, Texas 79101 (806) 374-2940 FAX:	Honorable Willis Smith Lipscomb County Judge P. O. Box 69 Lipcomb, Texas 79056 0069 (806) 862-4131 FAX:
PERMIAN BASIN SDA			
Mr. Ernie Crawford, Executive Director Permian Basin Regional Planning Commission 2910 La Force Drive, Suite 101 (Zip: 79711) P. O. Box 60660 Midland, Texas 79711-0660 (915) 563-1061 FAX: (915) 563-1728	Mr. Willie Taylor, Employment Director Permian Basin Regional Planning Commission 2910 La Force Drive, Suite 101 (Zip: 79711) P. O. Box 60660 Midland, Texas 79711 0660 (915) 563-1061 FAX: (915) 563 1728	Mr. John Foster, PIC Chair General Manager KWES-TV P. O. Box 60150 Midland. Texas 79711 0150 (915) 567 9999 FAX: (915) 561 5136	Honorable Max Townsend Gaines County Judge P. O. Box 847 Seminole, Texas 79360 (915) 758 5411 FAX: (915) 758 9258
RURAL CAPITAL AREA SDA			
Mr. James Satterwhite, Executive Director Rural Capital Area Private Industry Council 1106 South Mays Street Suite 220 (Zip: 78664-6746) P. O. Box 1565 Round Rock, Texas 78680-1565 (512) 244-7966 FAX: (512) 244 9023	Same as Grant Recipient	Mr. Mike Swayze, PIC Chair Pena, Swayze & Company 1717 North IH-35, Suite 300 Round Rock, Texas 78664 (512) 255-2165 FAX: (512) 255 2466	Honorable Rebecca Hawener Caldwell County Judge Caldwell County Courthouse, Room 307 Lockhart, Texas 78644 (512) 398 1808 FAX: (512) 398 1814

TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
RURAL COASTAL BEND SDA			
Mr. Carlos Herrera, Executive Director & JTPA Program Director Rural Coastal Bend Private Industry Council 307 North St. Marys (Zip: 78102) P. O. Box 1780 Beeville, Texas 78104-1780 (512) 358-8941 FAX: (512) 358-2130	Same as Grant Recipient	Mr. Emilio Garza, PIC Chair Rural Coastal Bend Private Industry Council 301 Houston Street, Suite 107 (ZIP: 78022) P. O. Box 299 George West, Texas 78022-0299 (512) 449-2255 FAX: (512) 358-2130	Honorable Jim Huff Live Oak County Judge P. O. Box 487 George West, Texas 78022-0487 (512) 449-2733 Ext 2 FAX: (512) 449-3155
SOUTH EAST TEXAS SDA			
Mr. Don Kelly, Executive Director South East Texas Regional Planning Commission 3501 Turtle Creek Drive (Zip: 77627) P. O. Drawer 1387 Nederland, Texas 77627-1387 (409) 727-2384 FAX: (409) 727-4078	Ms. Linda Brown Turk, JTPA Program Director Employment and Training South East Texas Regional Planning Commission P. O. Drawer 1387 Nederland, Texas 77627-1387 (409) 727-2384 FAX: (409) 727-4078	Mr. Harry Wood, PIC Chair South East Texas Publications P. O. Box 3150 Beaumont, Texas 77704 (409) 838-6581 FAX: (409) 833-6718	Honorable Richard P. LeBlanc, Jr. Jefferson County Judge Jefferson County Courthouse P. O. Box 4025 Beaumont, Texas 77704-4025 (409) 835-8466 FAX: (409) 839-2311
SOUTH PLAINS SDA			
Mr. W. D. Powell, Jr., Executive Director South Plains Community Action Association 411 Austin Street (Zip: 79336) P. O. Box 610 Levelland, Texas 79336-0610 (806) 894-6104 FAX: (806) 894-5349	Same as Grant Recipient	Mr. Douglas B. Allen, PIC Chair V. T. S. 1012 East Waylon Jennings Boulevard Littlefield, Texas 79339 (806) 385-6451 FAX: (806) 385-6455	Honorable Wayne Whiteaker Lamb County Judge Lamb County Courthouse, Room 101 Littlefield, Texas 79339-0706 (806) 385-4222 FAX: (806) 385-6485

TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
SOUTH TEXAS SDA			
Ruben M. Garcia, PIC Chair South Texas Private Industry Council Zapata Highway and Loop 20 P. O. Box 1757 Laredo, Texas 78044-1757 (210) 722-3973 FAX: (210) 725-2341	Eduardo Guerra, Executive Director South Texas Private Industry Council 4717 Daugherty P. O. Box 1757 Laredo, Texas 78044-1757 (210) 722-3973 FAX: (210) 725-2341	Same as Grant Recipient	Honorable Mercurio Martinez, Jr. Webb County Judge Webb County Courthouse P. O. Drawer 29 Laredo, Texas 78042-0029 (210) 727-7272 Ext 505 FAX:
TARRANT COUNTY SDA			
Honorable Tom Vandergriff Tarrant County Judge Tarrant County Administration Building 100 East Weatherford Street Fort Worth, Texas 76196-0105 (817) 884-1441 FAX: (817) 884-2793	Ms. Judy McDonald, JTPA Program Director Tarrant County Employment and Training 2601 Scott Avenue, #203 Fort Worth, Texas 76103 (817) 531-5690 FAX: (817) 531-5699	Dr. Robert McAbee, PIC Chair Tarrant County Employment and Training 2601 Scott Avenue, #203 Fort Worth, Texas 76103 (817) 625-9811 FAX: (817) 625-3211	Same as Grant Recipient
TEXOMA SDA			
Ms. Frances Pelley, Executive Director Texoma Council of Governments 10000 Grayson Drive Denison, Texas 75020-8399 (903) 786-2955 FAX: (903) 786-8122	Mr. Siras Browning, JTPA Program Director Texoma Council of Governments 10000 Grayson Drive Denison, Texas 75020-8399 (903) 786-2955 FAX: (903) 786-8122	Mr. Jim Crittenden, PIC Chair Crittenden Propane Company East Sam Rayburn Freeway Bonham, Texas 75418 (903) 583-4212 FAX: (903) 583-7699	Honorable Julie Ellis Starr Mayor Pro Tem, City of Southmayd 2507 Shoreline Sherman, Texas 75090 (903) 893-9479 FAX:

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TEXAS DEPARTMENT OF COMMERCE
JOB TRAINING PARTNERSHIP ACT

STATE OF TEXAS SERVICE DELIVERY AREAS (SDA) DIRECTORY

GRANT RECIPIENT	ADMINISTRATIVE ENTITY	PIC CHAIR	CHIEF ELECTED OFFICIAL
UPPER RIO GRANDE SDA			
Mr. Norman R. Haley, Executive Director Upper Rio Grande Private Industry Council 1155 Westmoreland Drive, Suite 235 El Paso, Texas 79925-5649 (915) 772-5627 FAX: (915) 779 8366	Same as Grant Recipient	Ms Aliana Apodaca, PIC Chair Positive Direction 4141 Pinnacle, Suite 216 El Paso, Texas 79902 (915) 544-7434 FAX: (915) 532-0181	Honorable Larry Francis Mayor, City of El Paso No. 2 Civic Center Plaza El Paso, Texas 79901-1196 (915) 541-4000 FAX: (915) 541-4501
WEST CENTRAL TEXAS SDA			
Mr. Brad Helbert, Executive Director West Central Texas Council of Governments 1025 East North 10th (Zip: 79601) P. O. Box 3195 Abilene, Texas 79604-3195 (915) 672 8544 FAX: (915) 675-5214	Mr. Tom K. Smith, JTPA Program Director Occupational Training West Central Texas Council of Governments 1025 East North 10th (Zip: 79601) P. O. Box 3195 Abilene, Texas 79604-3195 (915) 672-8544 FAX: (915) 675-5214	Mr. Rod Waller, PIC Chair Crown Industrial Coating 4521 Fredonia Snyder, Texas 79549 (915) 573-9467 FAX:	Honorable Larry May Commissioner City of Sweetwater P. O. Box 3195 Abilene, Texas 79604-3195 (915) 235-1788 FAX: (915) 235-1780

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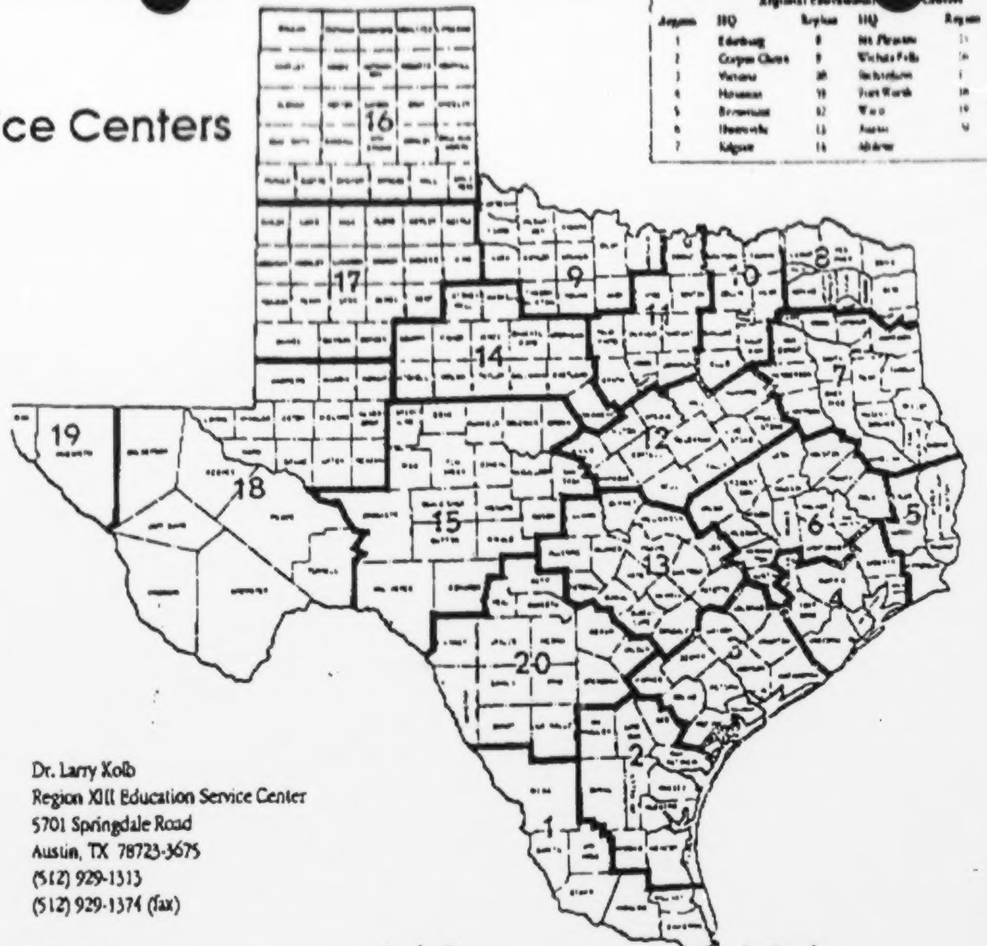

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5	Beaumont	12	Waco	19	El Paso
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(210) 383-5611
(210) 383-3524 (fax)

Vita Canales
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Corpus Christi, TX 78401-2599
(512) 883-9288
(512) 883-3442 (fax)

Donna Bentley
Region III Education Service Center
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Victoria, TX 77901-2899
(512) 573-0731
(512) 576-4804 (fax)

Dr. Lois Cunningham
Region IV Education Service Center
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Houston, TX 77092-2096
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(713) 462-6827 (fax)

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2295 Delaware Street
Beaumont, TX 77703-4299
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Kilgore, TX 75662-2698
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Sharon Thompson
Region VIII Education Service Center
P.O. Box 1894
Mt. Pleasant, TX 75455-1894
(903) 572-8551
(903) 572-8203 (fax)
(903) 865-8331 (H)

Dianna Clayton
Region IX Education Service Center
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(817) 322-6928 (ask for fax line)

Gaye Lynn Seawright
Region X Education Service Center
P.O. Box 831300
Richardson, TX 75083-1300
(214) 231-6301
(214) 231-3642 (fax)

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Region XI Education Service Center
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(817) 625-5310 (fax)

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Region XII Education Service Center
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Waco, TX 76702-3409
(817) 666-0823
(817) 754-5333 (fax)

Dr. Larry Kolb
Region XIII Education Service Center
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Austin, TX 78723-3675
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(512) 929-1374 (fax)

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Region XIV Education Service Center
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Abilene, TX 79601-9411
(915) 675-8600
(915) 675-8659 (fax)

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Region XVI Education Service Center
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Amarillo, TX 79120-0600
(806) 376-5521
(806) 373-3432 (fax)

Marilyn Stone
Region XVII Education Service Center
1111 West Loop 289
Lubbock, TX 79416-5029
(806) 792-4000
(806) 793-4803 (fax)

Carolyn North
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(915) 563-2380
(915) 567-3290 (fax)

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